DEPARTMENT OF THE ARMY TECHNICAL MANUAL TM 11-2246

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER TO 31W4-2FGC25-1

TELETYPEWRITER SETS
AN/FGC-25
AND
AN/FGC-25X

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

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TECHNICAL MANUAL
No. 11-2246
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DEPARTMENTS OF THE ARMY AND
THE AIR FORCE
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TELETYPEWRITER SETS AN/FGC-25 AND AN/FGC-25X

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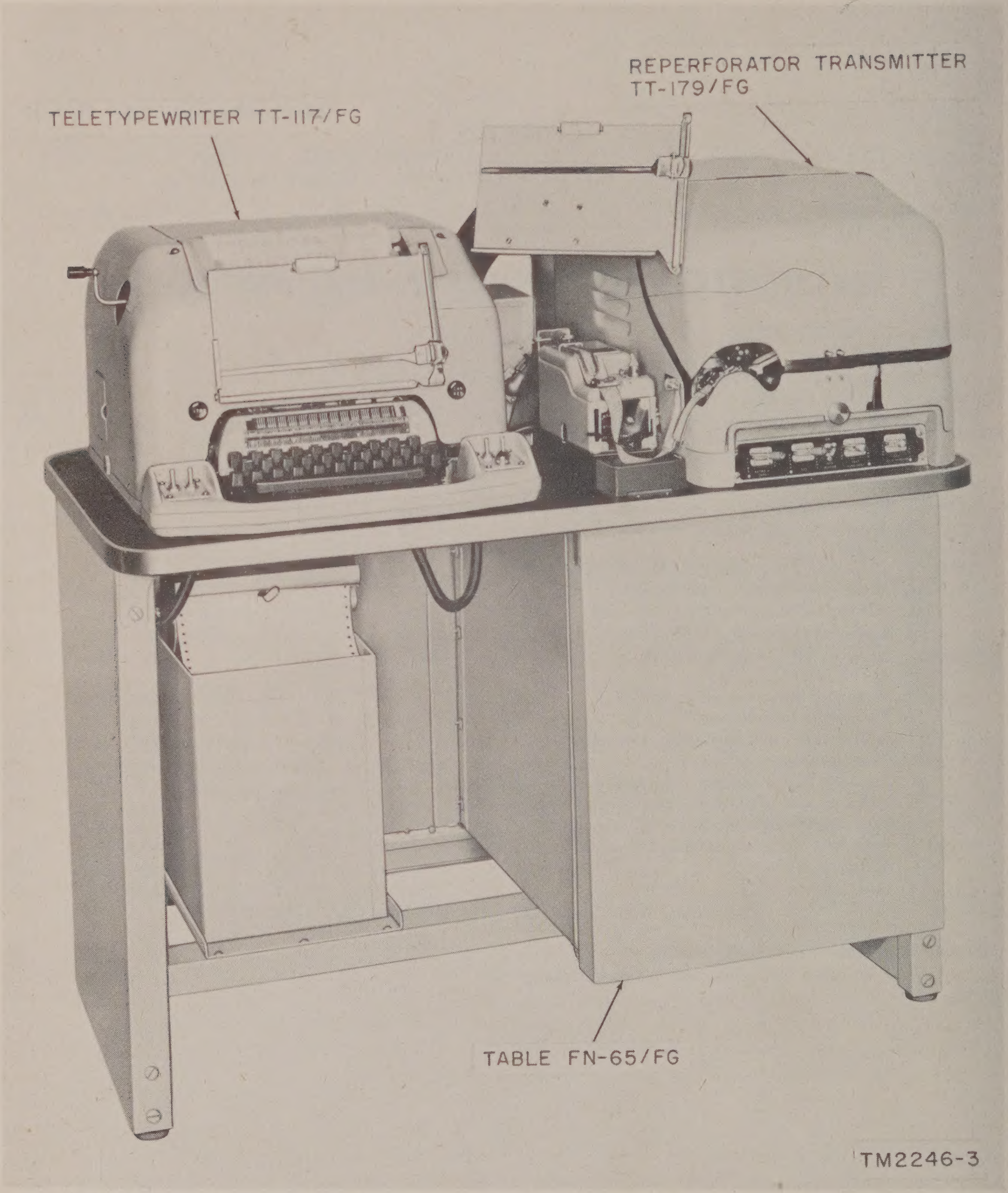

Figure 1. Teletypewriter Set AN/FGC-25.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the use of all personnel concerned with Teletypewriter Set AN/FGC–25(*) (fig. 1) and AN/FGC–25X. The book covers the description, installation, operation, theory, and maintenance of the teletypewriter set.

b. Official nomenclature followed by (*) is used to indicate both models of the equipment covered by this manual. Thus, Teletypewriter Set AN/FGC–25(*) represents Teletypewriter Sets AN/FGC–25 and AN/FGC–25X.

c. Forward comments on this publication directly to Commanding Officer, The Signal Corps Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army equipment and when performing preventive maintenance:

a. DD Form 6 (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in AR 700–58 (Army), Navy Shipping Guide, Article 1850–4 (Navy), and AFR 71–4 (Air Force).

b. DA Form 468 (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in AR 700–38.

c. DD Form 535 (Unsatisfactory Report) will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in AR 700–38 and AF TO 00–35D–54.

d. DA Form 11–253 (Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Teletypewriter)) will be prepared in accordance with instructions on the back of the Form (fig. 170).

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Teletypewriter Set AN/FGC–25(*) is a fixed station unit designed for the transmission, monitoring, and reception of messages in communication centers. The set is capable of receiving messages, cutting tape locally, sending a message, and making page or tape copy or both. Messages can be sent either from the keyboard or from previously punched tape through the transmitter-distributor. The set is equipped to make page copy of either the tape message sent to the distant station or the copy from the keyboard transmitting unit. Both methods of transmission may be used and the station connected to two independent lines. The set is capable of receiving the messages in either punched and printed tape or page copy form, or in both forms simultaneously. The set is also capable of punching and printing tape for future transmission.

b. Teletypewriter Set AN/FGC–25 consists of three major components, Teletypewriter TT–117/FG, Reperforator-Transmitter TT–179/FG, and Table FN–65/FG. The operating units are supplied with dust covers which can be removed easily for servicing.

c. Teletypewriter Set AN/FGC–25X includes Teletypewriter TT–119/FG, Reperforator-Transmitter TT–178/FG, and Table FN–65/FG.

d. Typical uses for Teletypewriter Set AN/FGC–25(*) are shown in figure 2. Other combinations can be used as desired. The keyboard transmitter of the TT–117/FG (or TT–119/FG) can be used to send directly to the signal line as shown in A. The transmitter-distributor of the TT–178/FG (or TT–179/FG) can also be used to send directly to a signal line as shown in B. The page printing mechanism of the TT–117/FG (or TT–119/FG) can receive a message from the signal line and type page copy as shown in C. The perforator of the TT–178/FG (or TT–179/FG) can receive a message directly from the signal line and punch and print tape as shown in D. The page printing mechanism and the transmitter-distributor can be connected in series so that tape fed into the transmitter-distributor will be typed into page copy by the page printing mechanism as shown in E. The keyboard transmitter and the perforator can be connected in series so that a message typed on the keyboard transmitter will be recorded by the perforator in punched and printed form on tape as shown in F. The page printing mechanism and transmitter-distributor can be connected in series as shown in G. When punched and printed tape is fed into the transmitter-distributor, a message is transmitted to the signal line, and the page printing mechanism simultaneously records the message as page copy. The page printing mechanism and keyboard can be connected in series and wired into one line; the perforator and transmitter-distributor can be connected in series and wired into a second line. With this arrangement, the keyboard transmitter can be used to send a message on one line while the page printing mechanism types a page copy of the message and the transmitter-distributor can be used to send a message out on the second line through the perforator. This arrangement is shown in H.

e. Teletypewriter Set AN/FGC–25(*) is capable of sending and receiving messages in standard,

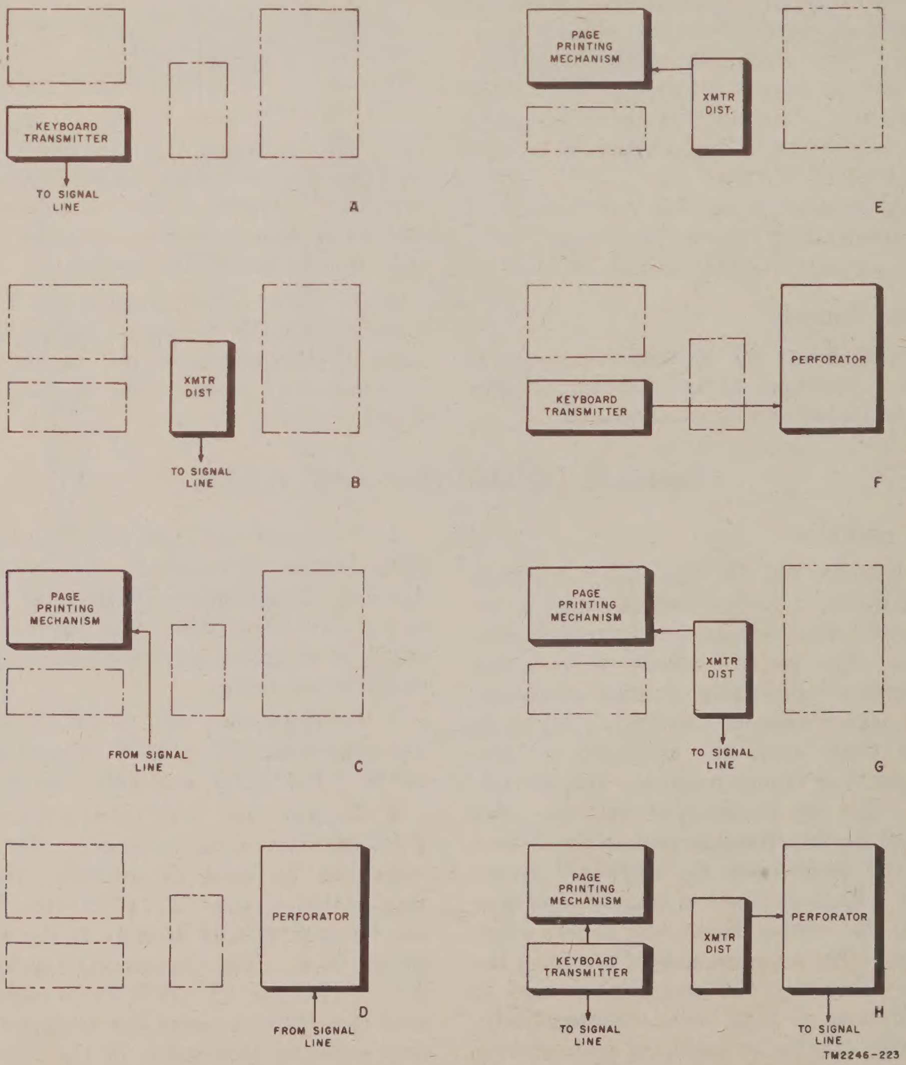

Figure 2. Uses of Teletypewriter Set AN/FGC–25(*), block diagram.

start-stop, 5-unit teletypewriter code. Sending and receiving can take place at 368.1, 404, 460, or 600 operations per minute (opm), or at 60, 66, 75, or 100 words per minute (wpm). The equipment is capable of sending or receiving 20- or 60-milliampere (ma) neutral signals, or can receive 30-ma polar signals.

f. The page printer is capable of printing one to five copies on roll paper, fanfold paper, or sprocket-fed forms 8½ inches wide. The perforator of the unit uses a ⅞-inch wide tape, and prints and punches 10 code combinations to the inch.

g. Teletypewriter Set AN/FGC–25(*) requires an input voltage of 95 to 250 volts alternating current (ac). The power supply provides a source of direct current (dc) for signal line current and for local circuits.

4. System Application

a. Teletypewriter Set AN/FGC–25(*) is designed to operate on a half- or full-duplex basis over dc wire lines (fig. 3), or in carrier or radio systems (fig. 4).

b. Teletypewriter Set AN/FGC–25(*) is equipped with a dc power supply to enable the set

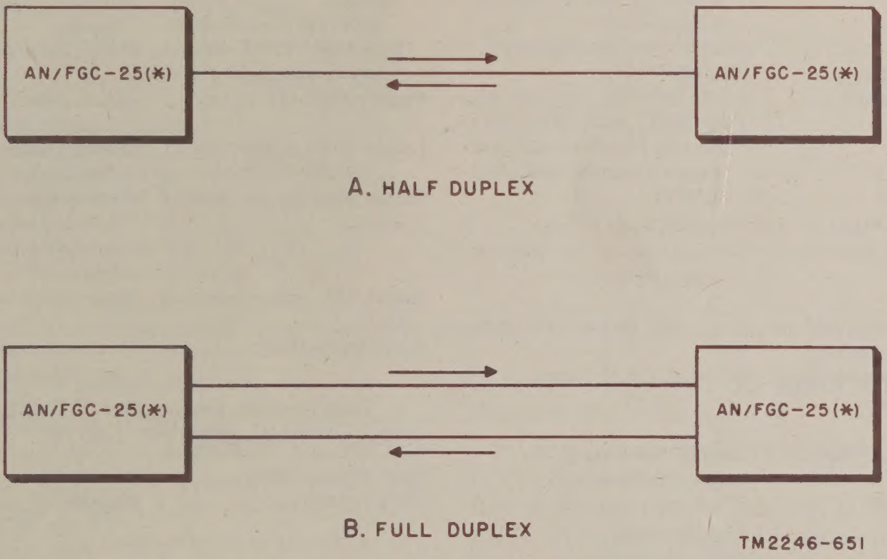

Figure 3. Dc wire systems, block diagrams.

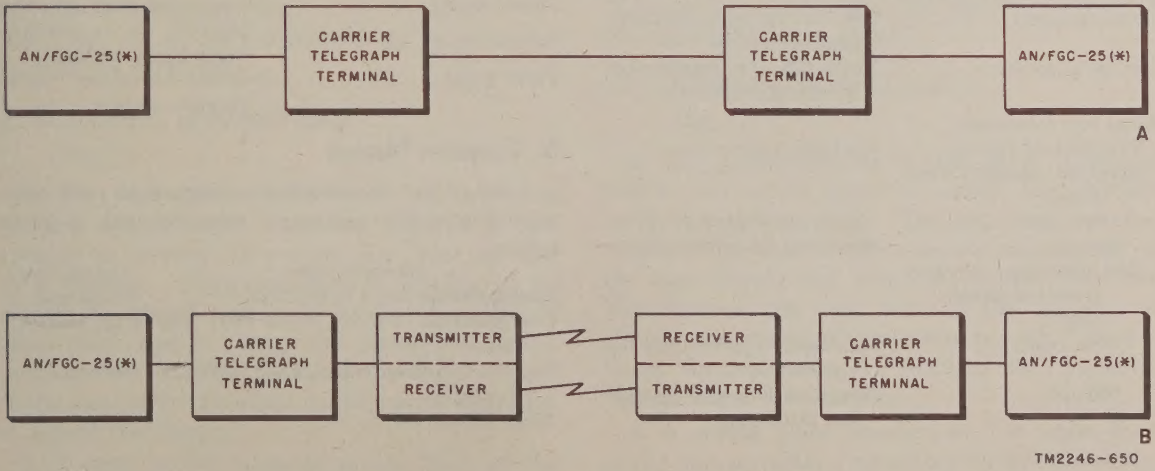
AN/FGC–25(*)
CARRIER TELEGRAPH TERMINAL
CARRIER TELEGRAPH TERMINAL
AN/FGC–25(*)
A
AN/FGC–25(*)
CARRIER TELEGRAPH TERMINAL
TRANSMITTER
RECEIVER
RECEIVER
TRANSMITTER
CARRIER TELEGRAPH TERMINAL
AN/FGC–25(*)
B
TM2246-650

Figure 4. Carrier or radio system, block diagrams.

to supply current to the local circuits and to the signal line.

c. The circuits of the operating components are controlled through a patch panel, which allows a change of the circuits by changing the plug and jack combinations on the panel. A variety of operating combinations are possible as described in chapters 2 and 3.

5. Technical Characteristics of Teletypewriter Sets AN/FGC–25 and AN/FGC–25X

a. Teletypewriter Set AN/FGC–25(*).

Type of installation	Fixed station; sending and receiving; direct wire or radio circuit.
Symbols	Standard communications.
Type of characters	English.
Input requirement	95- to 250-volt, 60-cycle ac.
Signaling code	Five unit, start-stop, stop impulse length equals start impulse length multiplied by 1.42.
Type of signals (send)	Neutral (20 or 60 ma).
Type of signals (receive)	Neutral (20 or 60 ma) or polar (30 ma).
Speed:	
Operations per minute (send and receive).	368.1, 404, 460, or 600 opm.
Words per minute (send and receive).	60, 66, 75 or 100 wpm.
Power demand:	
Series governed motor	Approx 150 watts.
Synchronous motor	Approx 120 watts.
Motor type:	
AN/FGC–25	Synchronous.
AN/FGC–25X	Series governed.
Motor speed	3,600 revolutions per minute.
Motor power requirements:	
Synchronous	105- to 125-volt, 60-cycle, single-phase, ac.
Series governed	105 to 125 volts, regulated or unregulated ac.
Signal bias tolerances:	
Transmitted signals	5 percent maximum.
Received signals (tolerance):	
368.1 opm	Maximum 40 percent bias.
600 opm	Maximum 35 percent bias.
End distortion tolerance (received signals only):	
368.1 opm	Maximum 35 percent spacing end distortion.
600 opm	Maximum 30 percent spacing end distortion.
Range adjustment	Scale calibrated 0 to 120; 100 scale units equal width of one unit signal pulse (22 milliseconds at 368.1 opm).
Total weight of installed equipment.	With full roll of paper and tape, approx 192½ lb.

b. Teletypewriter TD–117/FG and Teletypewriter TT–119/FG.

Characters per line	72.
Type of paper feed	Friction or sprocket.
Paper capacity	Adjustable to accommodate standard 1- through 5-copy roll, fanfold paper, or sprocket-fed forms 8½ in. wide.
Functions:	
Carriage return (CAR. RET. key or automatic).	Returns carriage to left margin.
Line feed (LINE FEED key or automatic).	Feeds paper one or two lines.
Figures shift (FIGS key)	Raises platen to upper case (figures) position.
Letters shift (LTRS key)	Lowers platen to lower case (letters) position.
Motor stop (upper case H key).	Stops motors of all interconnected teletypewriters equipped with motor stop feature.
Signal bell (upper case S key).	Rings signal bell.
Space (space bar)	Moves carriage to right without printing.

c. Reperforator-Transmitter TT–179/FG and Reperforator-Transmitter TT–178/FG.

Type of tape feed	Sprocket.
Tape capacity	Enough for approximately: 5 hours 20 minutes at 60 wpm operation. 3 hours 10 minutes at 100 wpm operation.
Power supply	Operates between 95- and 250-volt, 50- to 60-cycle, single-phase, ac input.
Patch panel	Provides convenient circuit interconnections.

6. Common Names

A list of the nomenclature assigned to each component and the common name for each is given below.

Nomenclatured item	*Common name*
Teletypewriter Set AN/FGC–25(*)	Teleprinter.
Teletypewriter TT–117/FG or TT–119/FG.	Page printer.
Reperforator-Transmitter TT–178/FG or TT–179/FG.	Perforator.
Table FN–65/FG	Table.

7. Table of Components

a. Teletypwriter Set AN/FGC–25.

Quantity	Component	Dimensions (in.)			Volume (cu ft)	Net weight (lb)
		Height	Width	Depth		
1	Reperforator-Transmitter TT–179/FG	$13\frac{3}{32}$	$17\frac{1}{8}$	$22\frac{3}{16}$	2. 9	79
1	Teletypewriter TT–177/FG	$11\frac{1}{4}$	$17\frac{1}{8}$	$20\frac{9}{16}$	2. 3	58
1	Table, FN–65/FG	27	$23\frac{1}{2}$	40	14. 7	52
1 set	Running spares (par. 12)					12
1	Line relay adapter box					

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

b. Teletypewriter Set AN/FGC–25X.

Quantity	Component	Dimensions (in.)			Volume (cu ft)	Net weight (lb)
		Height	Width	Depth		
1	Reperforator-Transmitter TT–178/FG	$13\frac{3}{32}$	$17\frac{1}{8}$	$22\frac{3}{16}$	2. 9	79
1	Teletypewriter TT–119/FG	$11\frac{1}{4}$	$17\frac{1}{8}$	$20\frac{9}{16}$	2. 3	58
1	Table FN–65/FG	27	$23\frac{1}{2}$	40	14. 7	52
1 set	Running spares (par. 12)					12
1	Line relay adapter box					

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

8. Description of Teleprinter

a. The teleprinter consists of a page printer (fig. 5) which includes a keyboard; a perforator (fig. 6) which includes a transmitter-distributor and power supply, and a table (fig. 7) to support the two units. The page printer is placed at the left on the table and the perforator at the right. The transmitter-distributor is mounted on the left side of the perforator.

b. Dust covers are installed on the page printer and on the perforator.

9. Description of Page Printer

(fig. 5)

a. The page printer dust cover has an access opening at the top. The rear portion of the opening is covered by a door; the front portion by a window. Openings make it possible to replenish the paper supply, to change the type of paper used, and to change the inking ribbon. A small access door is provided on the left side of the dust cover to allow maintenance personnel to adjust the range.

b. A copy holder mounted at the front of the dust cover holds the copy in line of easy vision of the operator. A second copy holder is provided for mounting on the right side of the page printer dust cover.

c. A standard teletypewriter keyboard is in front of and below the dust cover. Above the keyboard is a character counter and the tabulator mechanism. A keyboard guard is mounted around the front of the keyboard. Four switch controls are mounted in the keyboard guard, two at either side of the guard. An end-of-line lamp is mounted in the right side of the guard.

10. Description of Perforator

(fig. 6)

a. The perforator has a dust cover which includes two access doors to enable the operator to service the machine. The top rear door permits the operator to place a new roll of tape on the tape supply reel when the supply runs out. The front access door permits the operator to change the inking ribbon when necessary, and to insert the tape into the printing and punching mechanism of the machine.

b. A switch plate installed on the lower front of the unit provides a mounting for five perforator control switches. A second panel installed at the lower rear of the unit mounts two ac convenience

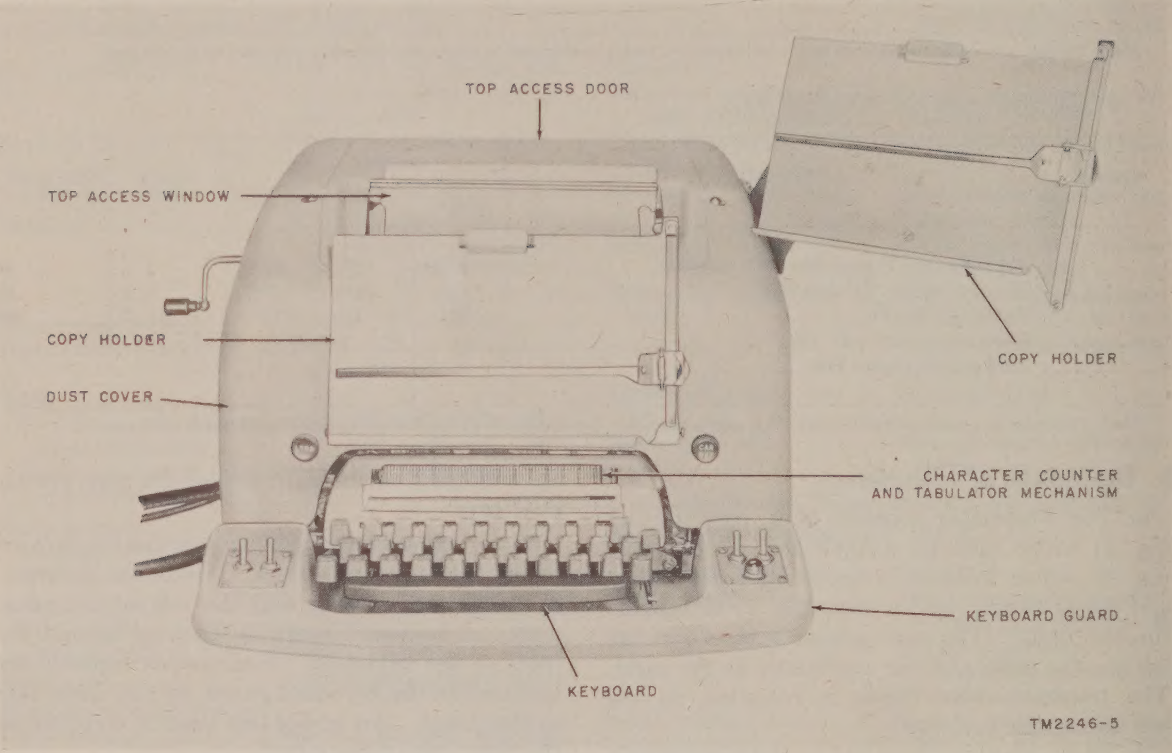

Figure 5. Page printer.

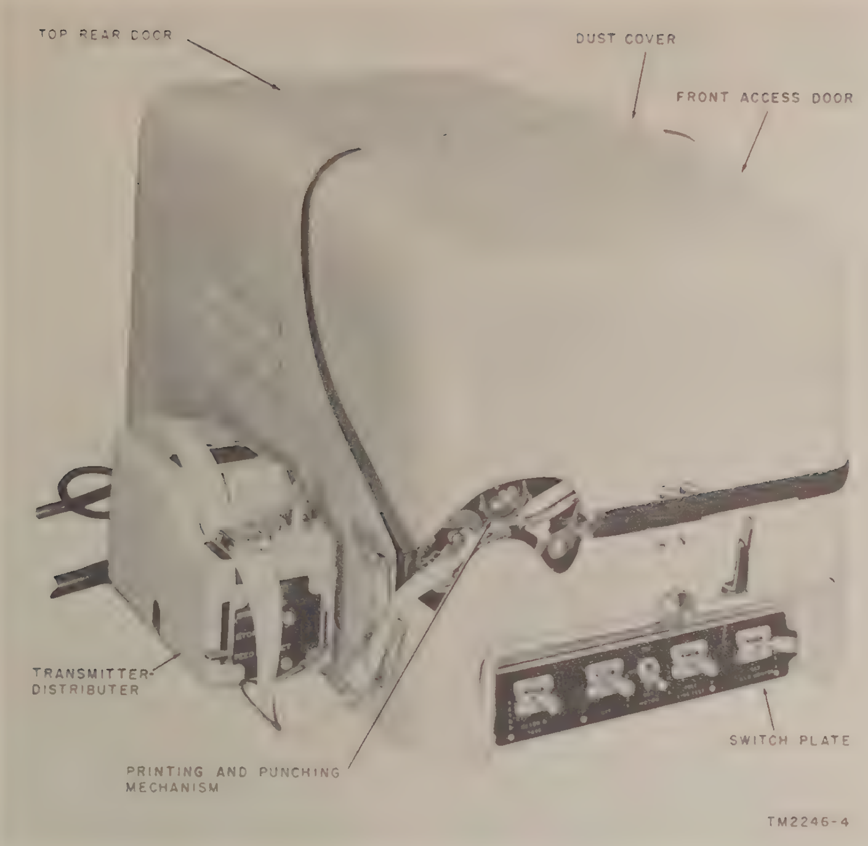

Figure 6. Perforator.

outlets, two fuses, and POWER switch S21. There is an opening in the rear of the dust cover to provide access for plugs from the page printer to jacks installed within the perforator dust cover.

11. Description of Table
(fig. 7)

a. The table is constructed to mount the page printer and the perforator at a height convenient to the seated operator. Openings are cut into the table top and guides are installed to guide cut tape, spent tape, and chad to the proper containers inside the table.

b. A hollow, sliding door is mounted on the right front of the table. Space is provided inside of the hollow door to store the cut tape until it is to be used. A spent tape and chad bin is pro-

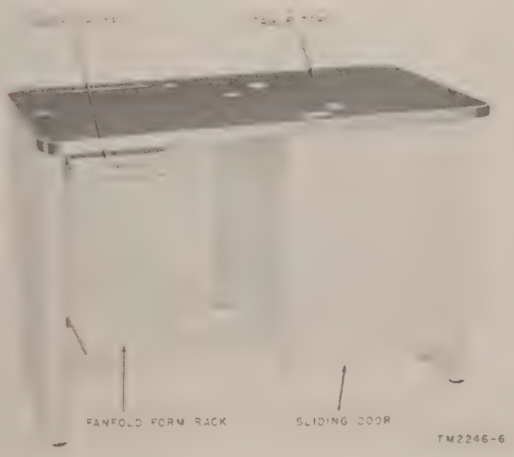

Figure 7. Table.

vided with the table. A fanfold form rack is installed at the left side of the table.

12. Running Spares

(fig. 8)

a. The following running spares are provided for use with the page printer:

1 fuse, 1/16-ampere
1 fuse, 1.6-ampere
1 lamp, 120-volt
1 roll paper
1 inking ribbon

b. The following running spares are provided for use with the perforator:

2 fuses, 4-ampere
1 fuse, ½-ampere
1 fuse, ¾-ampere
1 lamp, 120-volt
1 tape roll

13. Differences in Models

The external appearances of the two models are identical. The differences in the models are listed below.

Model	Motor	
	Synchronous	Series-governed
AN/FGC-25:		
Teletypewriter TT-117/FG	x	
Reperforator-Transmitter TT-179/FG	x	
AN/FGC-25X:		
Teletypewriter TT-119/FG		x
Reperforator-Transmitter TT-178/FG		x

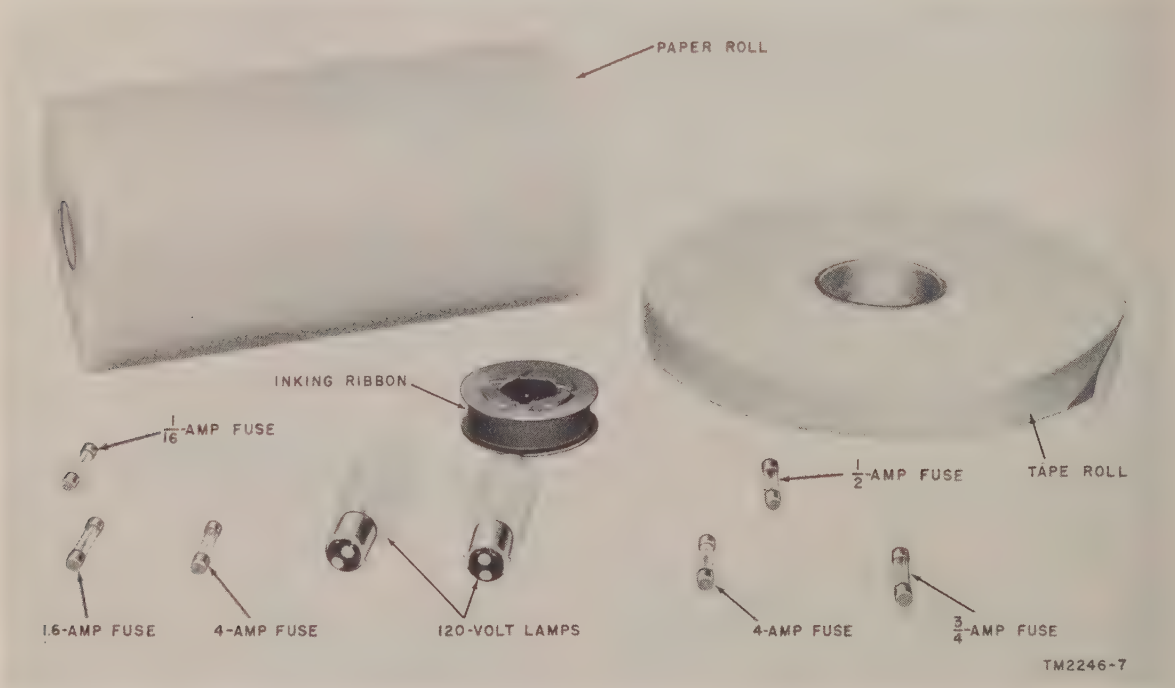

Figure 8. Running spares.

CHAPTER 2

INSTALLATION

Section I. SERVICE ON RECEIPT OF MATERIAL

14. Packaging Data

a. Each teleprinter is packed in three containers for either domestic or export shipment. One contains the page printer, another contains the perforator and a line relay adapter, and the third contains the table and separately packaged running spares.

b. When packed for domestic shipment, the page printer (fig. 9) and the perforator (fig. 10) are bolted to baseboards and are packed in corrugated cartons fitted with spacers to prevent rattling or shifting in the package. These corrugated cartons are then sealed with gummed tape and packed in wooden shipping cases or boxes. The table and accessory package (fig. 11) has a separate carton which contains a copy holder, waste chute cover, spent tape guide, and tape storage guide. This carton is packed in a second carton along with the paper, rolls, perforator tape, inking ribbons, and technical manuals. After this carton is sealed with gummed tape, it is placed inside the spent tape and chad bin. The spent tape and chad bin is positioned in its proper place in the table, and the table door is closed. Filler strips are placed on both ends of the table top and the entire unit is placed in a corrugated carton which then is sealed with gummed tape. Following is a chart listing the size, weight, and volume of the units packed for domestic shipment.

Unit	Height (in.)	Width (in.)	Depth (in.)	Volume (cu ft)	Unit weight (lb)
Page printer	14½	20¾	27¼	4. 8	83
Perforator and line relay adapter	14½	20¾	27¼	4. 8	104
Table and running spares	28	24	40½	15. 8	103

c. When packed for export shipment, the page printer and the perforator are bolted to baseboards and are packed in corrugated cartons fitted with spacers to prevent rattling or shifting in the package. These corrugated cartons are sealed with gummed tape, wrapped with waterproof barrier material, each placed in a second corrugated carton, and sealed with gummed tape. These packages then are placed in wooden shipping boxes which are lined with excelsior. The table and accessories are packed in the same manner for export shipment as for domestic shipment (*b* above) except that the corrugated carton which is the final package for domestic shipment is placed in a wooden box when packed for export shipment. Following is a chart listing the size, weight, and volume of units packed for export shipment.

Unit	Height (in.)	Width (in.)	Depth (in.)	Volume (cu ft)	Unit weight (lb)
Page printer	20	26	33	9. 9	93
Perforator	20	26	33	9. 9	114
Table	29	25½	42	18. 0	113

15. Uncrating, Unpacking, and Checking New Equipment

(figs. 9, 10, and 11)

a. Unpack the table to provide a place to mount the other components as they are unpacked. When opening the shipping boxes, observe the ordinary precautions to avoid damaging the contents. Remove the package containing the spare part from the spent tape and chad bin of the table. Open the package and remove the waste chute cover, the spent tape guide, the tape storage guide, the extra copy holder and the bag containing the mounting hardware.

b. Unpack each of the other two boxes and mount the components on the table (par. 16).

c. When conditions warrant and storage space is available, replace the empty cartons in the outer containers and place them in storage for future use.

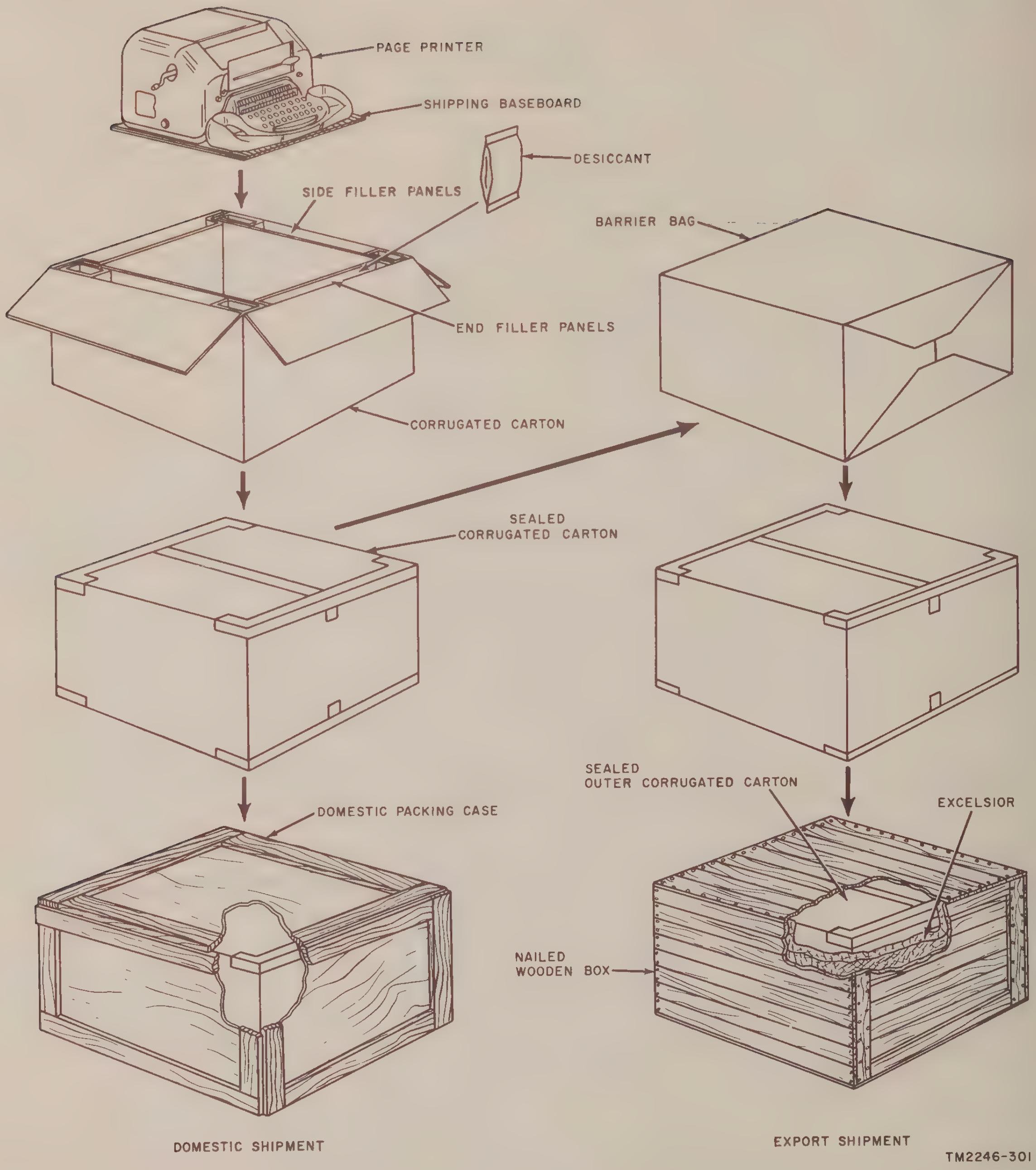

Figure 9. Page printer packaged for domestic and for export shipment.

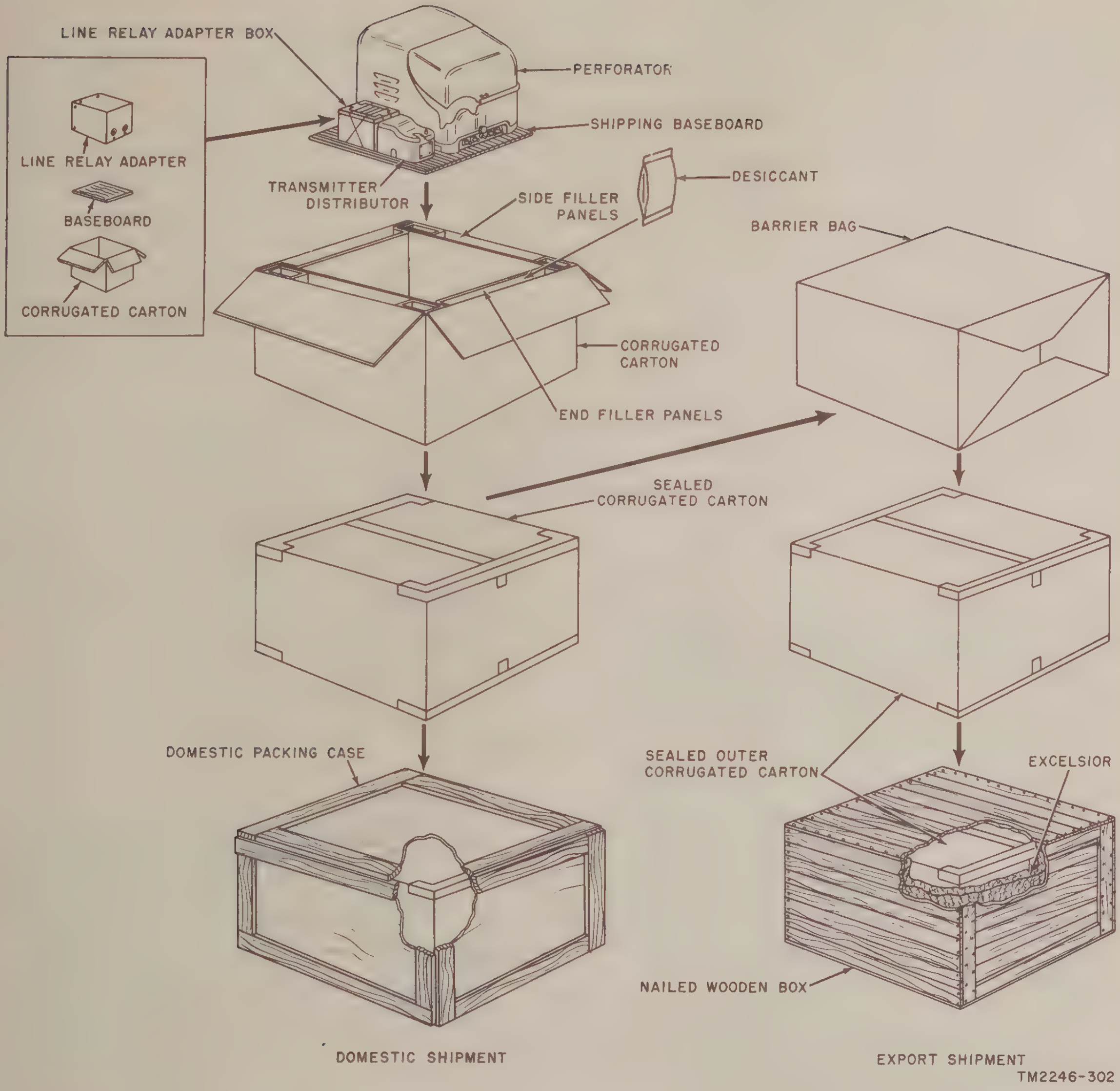

Figure 10. Perforator packaged for domestic and for export shipment.

16. Mounting Components

a. Page Printer and Perforator. The page printer and perforator may be placed on screw posts installed in the table top for normal fixed plant use or bolted to the table top for vehicular use. Mount the page printer and perforator as follows:

(1) Position the page printer and perforator on the table so that the four mounting holes in the base casting of each unit are alined with the mounting holes in the table top.

(2) If the unit is to be bolted to the table top, insert one ¼–20 x 2-inch bolt 10065 and lockwasher 10427 through each mounting hole in the base casting of the page printer and one ¼–20 x 1¾-inch bolt 10066 through each mounting hole in the base casting of the perforator. If the screw posts are used to mount the units, insert one screw post 56534 into the table top, through each mounting hole at the rear of the base casting of both the page printer and perforator.

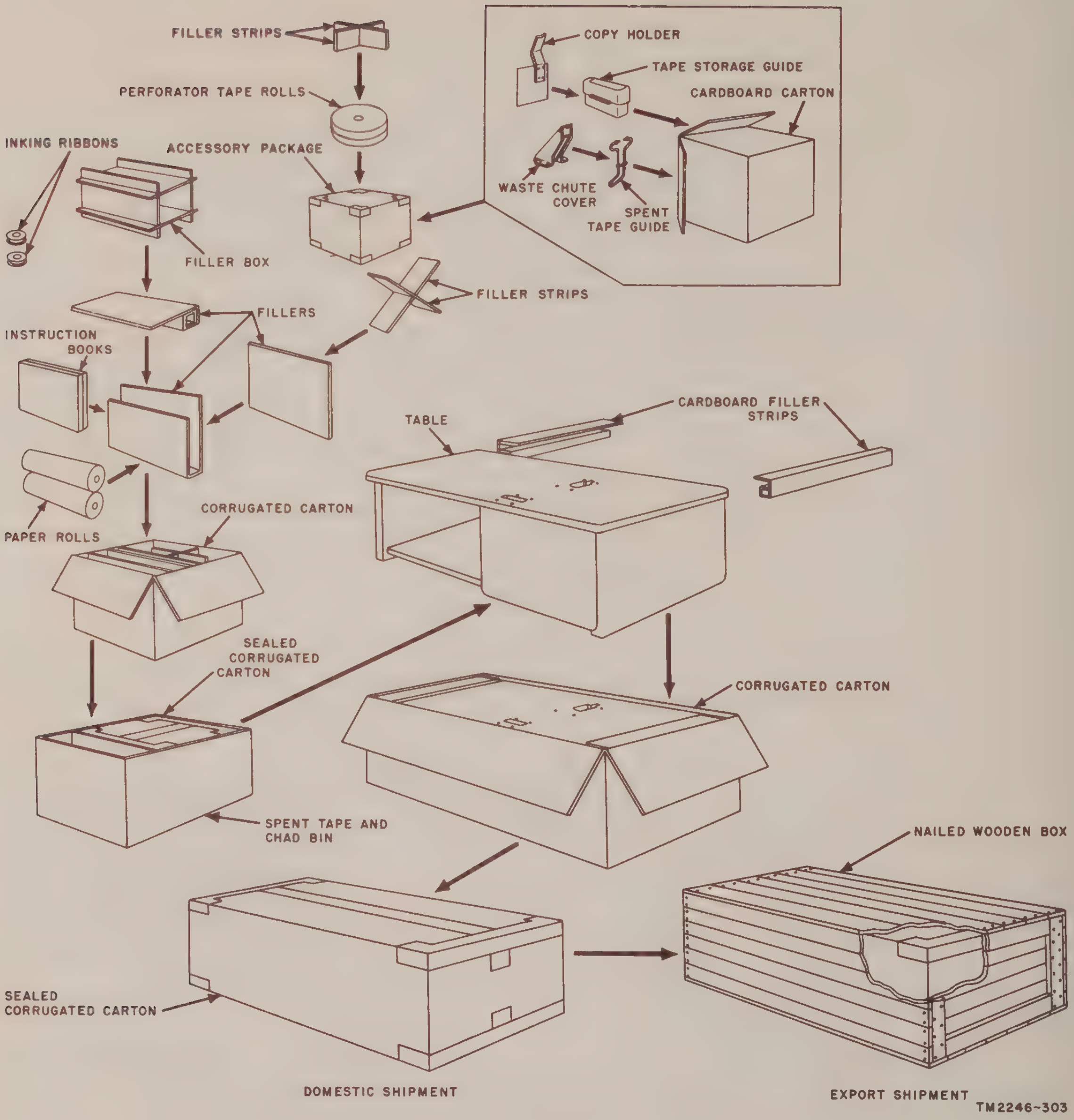

Figure 11. Table, spare parts, and accessories packaged for domestic and export shipment.

b. Relay Box.

(1) Remove the two screws that fasten the cover to the relay box.

(2) Position the relay box over the four mounting holes at the rear center of the table top.

(3) Insert the four socket head screws through the mounting holes in the bottom of the relay box and screw them into the captive nuts in the table top.

(4) Replace the relay box cover.

c. Spent Tape Chute Assembly.

(1) Position the spent tape chute assembly over the four mounting holes at the center of the table top, just in front of the relay box. The spent tape chute should curve toward the front of the table.

(2) Insert four round head screws into the table top through the four mounting holes in the spent tape chute assembly.

(3) From the underside of the table top, secure the assembly to the table top with the four speed nuts.

d. Tape Storage Guide

(1) Position the tape storage guide over the large hole in the front center of the table top.

(2) Place the two guide clamps against the tape storage guide parallel to the front of the table.

(3) Fasten the clamps to the table top with four bind head screws.

e. Extra Copy Holder.

(1) Remove the page printer dust cover.

(2) From inside the dust cover aline the nut plate with the mounting holes in the dust cover.

(3) Position the extra copy holder so that the mounting holes are alined with the holes in the cover and nut plate.

(4) Fasten the extra copy holder to the cover with four screws.

(5) Replace the page printer dust cover.

Section II. INSTALLATION AND INTERCONNECTION OF COMPONENTS

17. Fuse Check

(figs. 12, 13, and 14)

Check the value of each of the fuses listed in the chart below before applying power to the unit:

Component	Location	Fuse symbol	Fuse ratings (amp)	Reference (fig.)
Page printer	Power input circuit.	F1	1.6	12
	Bias circuit	F4	¹⁄₁₆	13
Perforator	Line circuit	F8	¾	14
	Power circuit	F5	4	14
	Power circuit	F6	4	14
	Bias circuit	F7	½	14

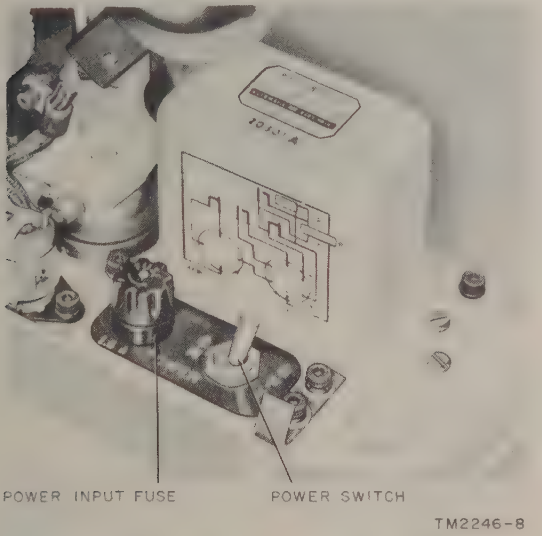

Figure 12. Power input fuse and power switch location.

18. Ground, Power, and Intermachine Connections

a. Connect the ground lead from the perforator power cable assembly to a low resistance ground.

b. Interconnect the machines as follows:

(1) Feed the ends of both the keyboard and perforator cable assemblies through openings provided in the table top. Interconnect the two cables beneath the table.

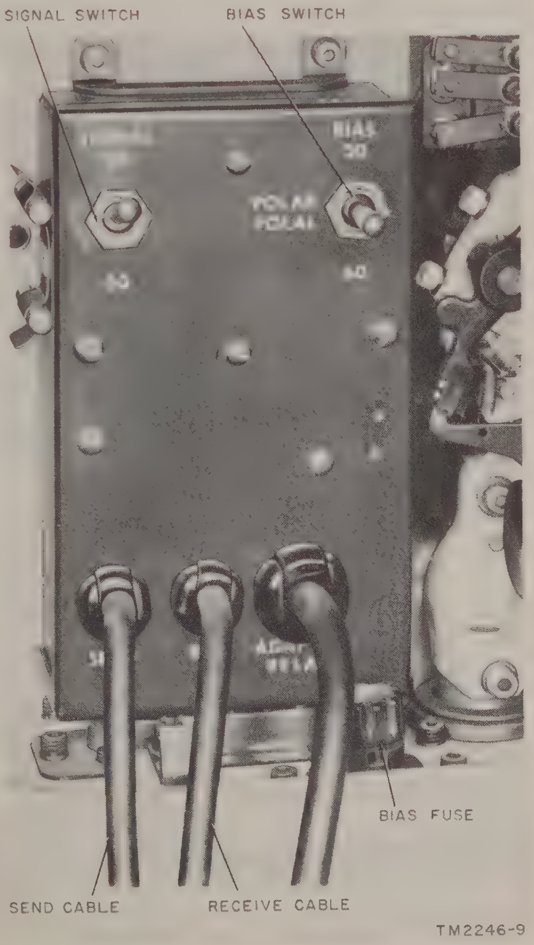

Figure 13. Bias fuse and terminal box.

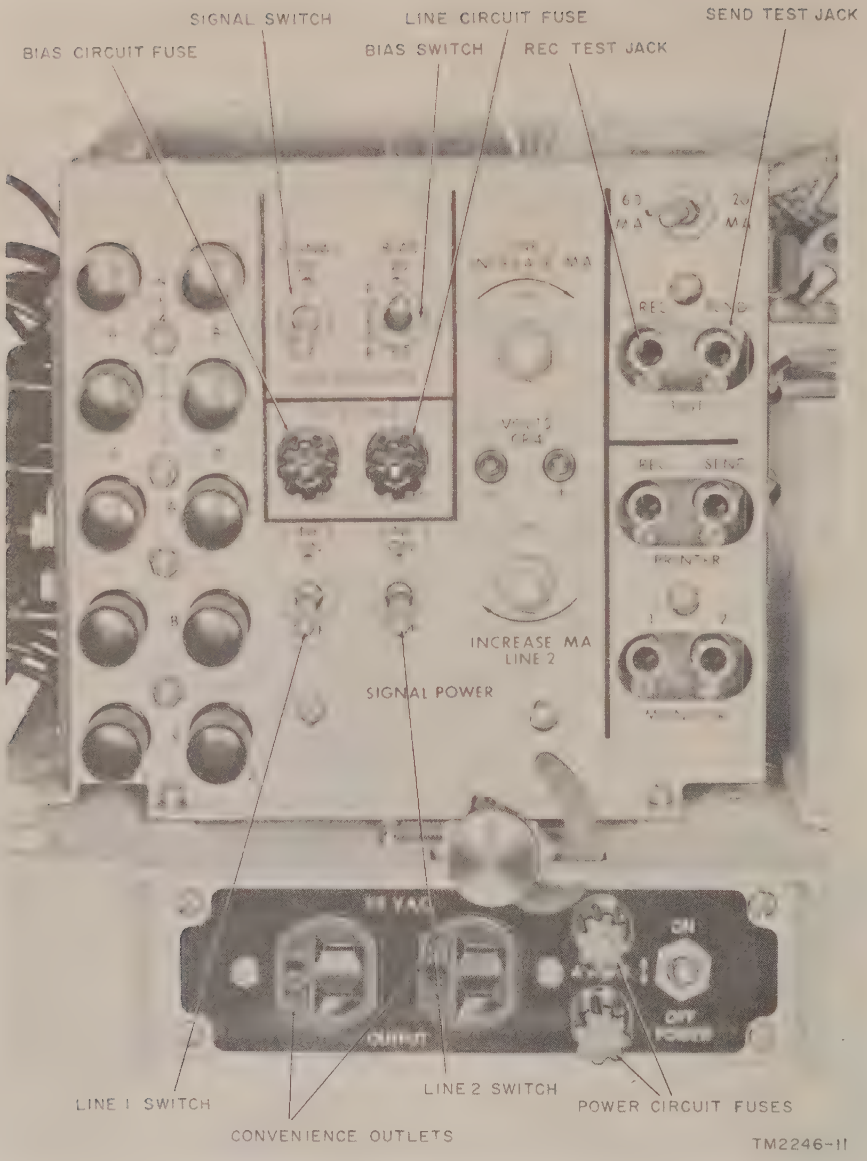

Figure 14. Perforator rear control panel.

(2) Insert the red plug of the receive cable (fig. 13) from the page printer terminal box into the REC TEST jack (fig. 14) on the back panel of the perforator.

(3) Insert the black plug of the send cable (fig. 13) from the page printer terminal box into the SEND TEST jack on the back panel of the perforator.

c. Make power connections as follows:

(1) Turn the page printer POWER and MOTOR switches to the OFF positions.

(2) Turn the perforator POWER and MOTOR switches to the OFF positions.

(3) Before installing the power cable assemblies, adjust the power supply transformer of the perforator. The perforator power supply transformer plugs and jacks may be reached through an opening in the underside of the perforator base (fig. 15). Remove the dust cover and tip the machine, allowing it to rest on the right side.

Adjust the power supply transformer as follows:

(*a*) With a voltmeter, check the voltage of the power supplied by the outlet to be used.

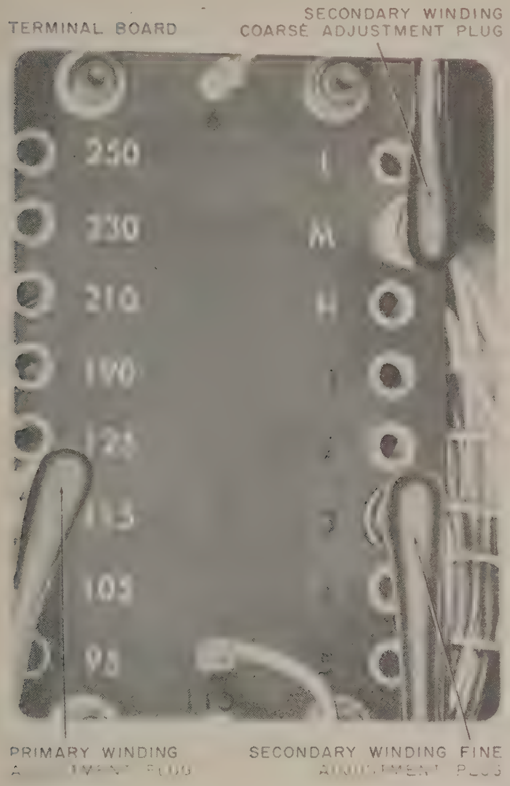
TERMINAL BOARD
SECONDARY WINDING COARSE ADJUSTMENT PLUG
250
230
210
190
125
115
105
95
I
M
H
PRIMARY WINDING ADJUSTMENT PLUG
SECONDARY WINDING FINE ADJUSTMENT PLUG
TM2246-10

Figure 15. Power transformer terminal board.

(*b*) Place the center flexible lead (primary winding) (fig. 15) into the jack nearest the voltage of the power available. If the voltage is midway between numbers, use the higher numbered jack.

(*c*) Place the secondary winding coarse adjustment lead into the jack marked M. Place the fine adjustment lead into the jack marked 3.

d. Insert the page printer power cable assembly in the 115 V. AC convenience outlet (fig. 14) at the back of the perforator.

e. Insert the power cable assembly from the perforator into the wall outlet.

19. Preparation

a. Service the page printer as follows:
  (1) Install the required type of paper (par. 32*a*).
  (2) Install a new inking ribbon if necessary (par. 32*e*).

b. Service the perforator as follows:
  (1) Install a roll or paper tape (par. 32*d*).
  (2) Check condition of the inking ribbon; install a new inking ribbon if necessary (par. 32*f*).

20. Local Test Patch Panel Connections

The patch panel on the perforator controls the signal circuits in the set. Before local testing, set up the panel for the local test condition. Make the connections indicated in the chart under patch panel condition A in paragraph 26*a* to place all receiving mechanisms and sending mechanisms in series (fig. 16).

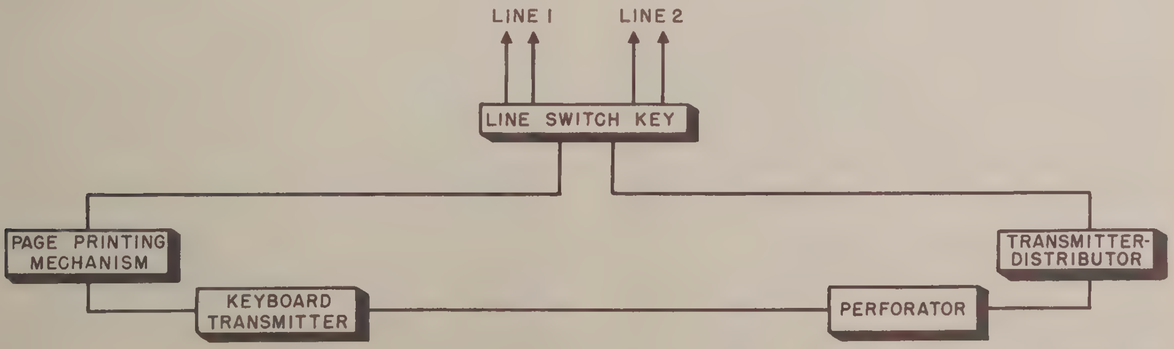

Figure 16. Local test condition simplified circuit, condition A.

21. Local Test Preliminary Checks and Adjustments

a. Check the platen and carriage locks to make sure they are released. If locked, loosen the plain wing nuts and swing the platen lock or carriage lockup arm away from the locking studs.

b. Position the page printer power control switches as follows:

(1) Set the SIGNAL switch on the terminal box (fig. 13) to 20 or 60 depending upon the signal level of the signal line to which the unit will be connected.

(2) Set the BIAS switch to the same setting as the SIGNAL switch.

(3) Set the SEND LOCK switch (fig. 35) to the SEND position.

c. Position the perforator power control switches as follows:

(1) Set the SIGNAL switch (fig. 14) to the same setting as the SIGNAL switch on the terminal box on the page printer.

(2) Set the BIAS switch to the same setting as the SIGNAL switch on the terminal box of the page printer.

(3) Set the switch above the test jacks to the same setting as the SIGNAL switch on the terminal box of the page printer (fig. 13).

(4) Check the signal line plugs from the page printer to make sure the red (receive) plug is in the REC TEST jack and that the black (send) plug is in the SEND TEST jack of the rear panel of the perforator (fig. 14).

d. Turn the page printer (fig. 12) and perforator POWER switches (fig. 15) to the ON positions.

e. Turn the page printer LIGHT switch (fig. 35) to the ON position; the copy light should light.

f. Turn the page printer and perforator MOTOR switches (fig. 41) to the ON positions; the page printer and the perforator motors should run and the perforator copy light should light.

22. Motor Speed Adjustment

Adjust the motor speed of series governed motors as follows:

a. Strike a 180-vps tuning fork against the palm of the hand. Do not strike the tuning fork sharply against a metal object or the fork may be damaged.

b. View the target spots at the end of the motor governor subassembly through the vibrating shutter of the tuning fork. Viewing the revolving spots through the shutter creates a stroboscopic effect which causes the target spot to appear stationary as motor speed becomes synchronous with the vibration speed of the tuning fork.

c. Make no adjustment if the selected target spot appears motionless when viewed through the vibrating shutter. If the spot appears to be moving clockwise (motor speed too fast), pull the end of the motor-governor adjustment worm outward. Hold it out until the apparent clockwise motion of the target spot has practically stopped. If the target spot appears to be moving counterclockwise (motor speed too slow), push the end of the motor-governor adjustment worm inward until the apparent counterclockwise motion of the target spot has practically stopped. To avoid overadjustment, release the worm slightly before the spot comes to a complete standstill.

d. Check the spot travel with a tuning fork again; readjust in the appropriate direction if necessary.

23. Friction Clutch and Transfer Lever Tension Spring Lubrication and Adjustment

Before operating the equipment check the lubrication and adjustment of the friction clutches and the tension springs as directed below.

a. Page Printer Friction Clutches and Transfer Lever Springs.

Name of part	Lubrication reference		Adjustment reference
	Item and fig.	Par.	Par.
Selector camshaft friction clutch.	17, fig. 173	139*c*	329
Square shaft friction clutch.	18, fig. 173	139*c*	330
Carriage feed friction clutch.	2, fig. 171	139*c*	372
Keyboard transmitter friction clutch.	11, fig. 171	139*c*	414
Carriage return safety clutch.	10, fig. 171	139*f*	373
Page printer transfer lever spring.	------------	------	327

b. Perforator Friction Clutches and Transfer Lever Spring.

Name of part	Lubrication reference		Adjustment reference
	Item and fig.	Par.	Par.
Transmitter-distributor friction clutch.	20, fig. 186	140*c*	527
Perforator transfer lever spring.			498, 499
Stop arm friction clutch.	13, fig. 184	140*c*	475
Selector camshaft friction clutch.	2, fig. 189	140*c*	447

24. Local Testing

a. Check the simultaneous signal circuit between the keyboard transmitter and perforator as follows:

(1) Set the keyboard control switch (fig. 41) in the TAPE position.

(2) Set the perforator control switch in the KEYBD position.

(3) Set the line switch key in the TEST position.

(4) Set the (ALR) MONITOR switch in the OFF position.

(5) Send alternate R and Y code combinations until about 36 inches of tape have been cut in this manner. Do not use the manual carriage return. The carriage should automatically return after the 72d character has been sturck. The end-of-line indicator lamp should light when the 66th character is struck. Check the printed and punched tape to make sure the printing and code punches are sharp and correct. Save the cut tape for later tests.

(6) Send the following test message five times in rapid succession: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK 1234567890-$!&'()/:;?,. Depress the CAR. RET. and LINE FEED keys after each test message. The carriage indicator should return to the left margin each time. Check the cut tape for accuracy. Save the cut tape for later tests.

(7) Depress the FIGS key and then the S (BELL) key. The perforator signal bell should ring.

b. Check the transmitter distributor as follows:

(1) Insert the test message tape into the transmitter-distributor as described in *c*(6) below.

(2) Move the STOP-START lever (fig. 40) to the FEED RETRACT position. The tape should move freely forward or backwards with light hand pressure.

(3) Move the STOP-START lever to the START position. The tape should feed steadily into the mechanism without bind.

(4) Move the STOP-START lever to the STOP position. The tape should cease to feed into the machine immediately.

(5) Move the STOP-START lever to the START position.

(6) Lift the tight-tape lever. The tape should cease to feed immediately. Release the tight-tape lever.

(7) Operate the tape cover latch to release the tape cover. The tape should cease to feed instantly.

(8) Close the tape cover and reinsert the tape if necessary.

(9) Allow the end of the tape to feed into the mechanism. The mechanism should cease to run as soon as the end of the tape feeds under the cover.

(10) Check the spent tape after it passes through the transmitter-distributor. It should be smooth and flat, and the code and feed holes should be sharp and free of distortion.

c. Set the rangefinders as follows:

(1) Set the keyboard SEND LOCK switch (fig. 35) in the LOCK position.

(2) Set the keyboard control switch (fig. 41) in the KEYBD position.

(3) Set the perforator control switch in the KEYBD position.

(4) Set the line switch key in the TEST position.

(5) Set the ALR MONITOR switch in the OFF position.

(6) Install the tape cut during the procedure described in *a*(5) above in the transmitter-distributor. Be sure the printed portion of the tape is toward the outer edge of the machine, and that the tape is properly threaded through the tight-tape lever. Close the tape cover.

(7) Move the STOP-START lever (fig. 40) to the START position; the tape should start feeding into the transmitter-distributor.

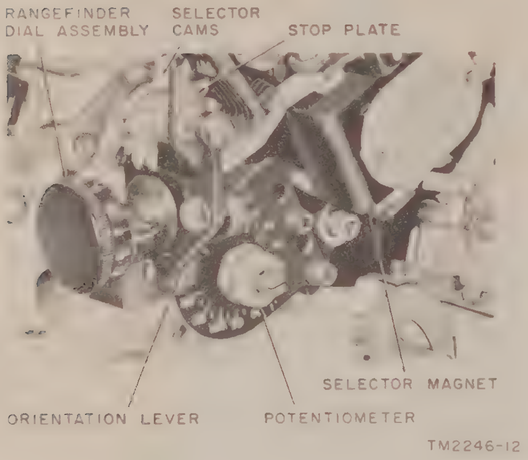

Figure 17. Page printer rangefinder mechanism.

(8) The alternate R and Y message should be printed on the page printing mechanism. Turn the rangefinder dial assembly on the page printer (fig. 17) to the maximum and minimum positions between which good copy is received. Note the readings at each position; then set the rangefinder dial assembly in a position midway between these points.

(9) Set the perforator control switch in the REPERF position.

(10) Similarly set the perforator rangefinder (fig. 18). Loosen the knurled nut before setting the adjustment and tighten it when the adjustment is made.

d. Check the automatic line feed and carriage return. The automatic line feed and carriage return should operate after the printing of the 72d character on a line. Since it takes approximately as long for the carriage to return as it does for three consecutive code groups to be received, letters will be printed while the carriage is returning. One letter will be printed two-thirds of the way from the left margin, another will be printed one-third of the way from the left margin, and the third will print in the first space at the left margin. This condition occurs whenever copy is received during automatic carriage return and line feed. If a sending operator properly operates the line feed and carriage return key levers, this condition does not occur.

e. With the switches set as directed in *c* above, insert the test message tape cut during the test procedure described in *a*(6) above in the transmitter-distributor. Check as follows:

(1) Move the STOP-START lever to the START position. A page copy of the test message should be printed by the page printing mechanism and a printed and punched tape copy should be made by the perforator. Check the accuracy of the message.

(2) Check the page copy for proper carriage return and line feed. At the end of each message group, the carriage should return and the paper should feed. Move the line feed lever to the single and then to the double line feed positions. The for-

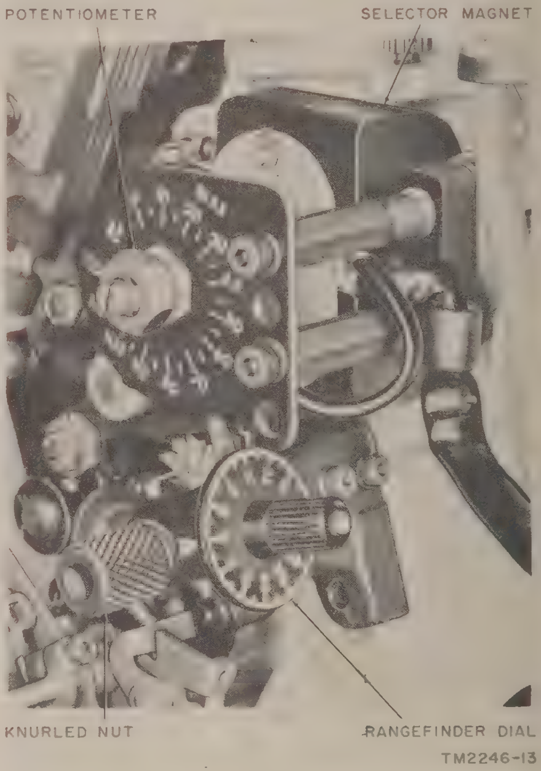

Figure. 18. Perforator rangefinder mechanism.

Note. The bias potentiometers have been adjusted to their optimum settings by the manufacturer. Do not attempt to adjust them at this time.

ward position is single line feed and the double line feed position is to the rear.

f. Check the keyboard transmitter sending sequential signals as follows:

(1) See that the keyboard control switch (fig. 41) is in the KEYBD position.

(2) See that the perforator control switch is in the REPERF position.

(3) See that the line switch key is in the TEST position.

(4) See that the ALR MONITOR switch is in the OFF position.

(5) Send the test message given in *a*(6) above five times in rapid succession from the keyboard. A page copy of the test message should be printed by the page printing mechanism, and a printed and punched tape copy should be made by the perforator. Check both copies for accuracy and clarity of printing. Check the perforator copy for sharp and correctly aligned punching.

g. Check the page printer signal bell as follows:

(1) Turn the perforator MOTOR switch (fig. 35) to the OFF position to stop the perforator signal bell from ringing.

(2) Depress the FIGS and then the S (BELL) keys. The page printer signal bell should ring.

(3) Return the perforator MOTOR switch to ON.

h. Check the motor stop operation as follows:

(1) Depress the FIGS and then the H (STOP) key levers. The page printer motor should stop.

(2) Operate the LINE–BREAK switch by moving it into the BREAK position and releasing it, allowing it to return to the LINE position. The page printer motor should start.

Note. The perforator motor does not have the motor stop feature, and must be shut off with the MOTOR switch.

i. Make the following additional tests:

(1) Depress the FIGS key lever to shift the platen to the upper case position. Press the LTRS button on the left side of the page printer dust cover. The platen should shift to the lower case position.

(2) Space the carriage to the midpoint of the page printer and press the CAR. RET. button on the right side of the dust cover. The carriage should return to the left side of the page printer.

(3) With the carriage at the left position of the page printer, press the manual space push button (fig. 39) located behind the right side of the platen. The carriage should move toward the right of the machine. Carriage movement should stop when the button is released.

(4) With the switches set as described in *f* above, type on the keyboard to check ribbon movement of the perforator and of the page printer inking ribbons. The perforator inking ribbon should move once for every two operations; the page printer inking ribbon should move with every operation.

(5) Space the carriage to the 65th space from the left margin. Depress the space bar once. The page printer margin signal bell should operate and the end-of-line indicator lamp should light.

(6) Check the operation of the tabulator mechanism as follows:

  (*a*) Press down on the tab crank arm (fig. 36) at the left of the tabulator and, with a pencil or other suitable instrument, pull down all of the red tab set levers. Release the tab crank arm.

  (*b*) Pull the tabulator locking lever at the right of the tabulator mechanism to its upward position.

  (*c*) Depress and hold the space bar and the repeat key. The indicator carriage should move to the right, stopping at the first red tab set lever from the left. Release the space bar and repeat key.

  (*d*) Depress and hold the space bar and the repeat key; the carriage should stop at the second red tab set lever from the left. Release the space bar and repeat key. Continue to check in this manner, making sure the carriage stops at every red tab set lever.

  (*e*) Push the tab locking lever to the downward position. Press the carriage return key to cause the carriage to move to the left side of the page printer. Depress and hold the space bar and repeat key. The carriage should move all of the way to the right side of the page printer without stopping at any of the tab set levers.

Section III. CONNECTION TO SIGNAL LINE

25. General

The teleprinter may be installed to meet a variety of operational requirements. This variety of operational possibilities is achieved by the use of the patch panel (fig. 19) and by varying the connections of the signal lines into the unit. Varying the setup of the patch panel changes the circuits through the teleprinter, thus changing the operation of the unit. Fifteen typical patch panel conditions are described in paragraph 26. These conditions are designated as condition A, condition B, condition C, etc. in the subsequent text for ease of identification. The patch panel plugs may be easily inserted or removed by pressing inward on the cord with the thumb and grasping the bakelite section of the plug with two fingers. After the patch panel has been set up, the operator can further control the operation of the equipment by means of the control switches on the switch plate at the front of the perforator. Detailed switch settings for each of the typical patch panel conditions described are given in chart form in paragraph 33.

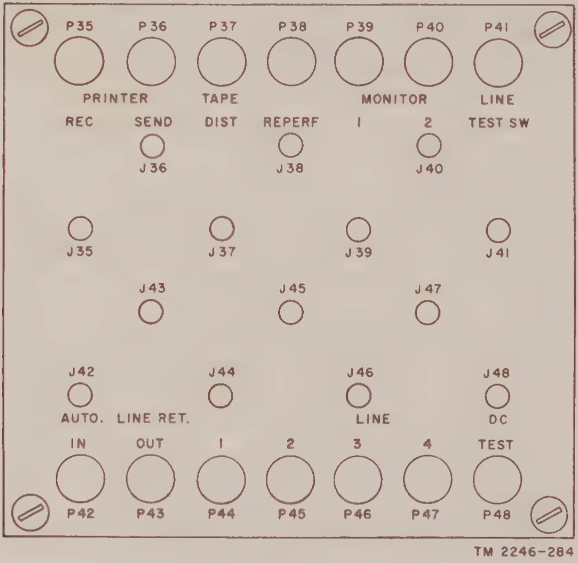

Figure 19. Patch panel.

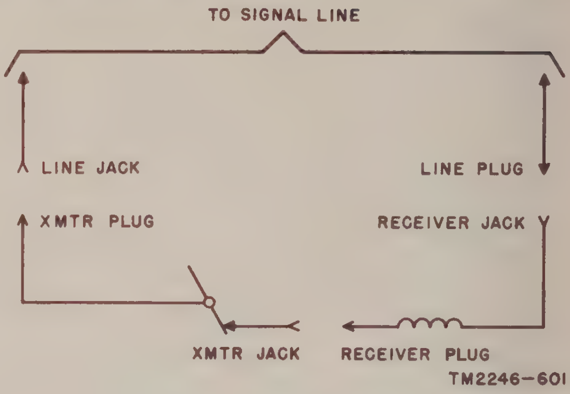

Figure 20. Typical series connection of teleprinter units.

26. Patch Panel Connections

The patch panel condition used for installation testing is described in paragraph 20. Other typical patch panel conditions are described in *a* through *o* below. Figure 20 is a simplified diagram showing how units of the teleprinter are connected in series with each other and with the distant station. A block diagram of the equipment in each condition is furnished to aid in visualizing the operation of the unit. Besides the illustration, a connection chart is provided for all of the patch panel conditions.

a. Patch Panel Condition A. Patch panel condition A (fig. 16) is used for testing the equipment, or for half-duplex operation of all of the equipment on line 1 or line 2. The automatic line return provision permits the page printer to monitor the local keyboard during tape perforation without disturbing the signal line or to make a page copy of a tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. Connections necessary to set up condition A are given in the chart below.

Patch panel plugs		Patch panel condition														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
PRINTER REC	P35	J42	J38	J39	J46	J38	J46	J42	J38	J42	J42	J46	J47	J46	J44	J46
PRINTER SEND	P36	J41	J44	J40	J44	J45	J37	J41	J40	J41	J38	J39	J40	J37	J39	J40
TAPE DIST	P37	J39	J45	J38	J45	J44	J41	J40	J39	J40	J41	J40	J39	J41	J40	J39
REPERF	P38	J37	J36	J44	J35	J47	J36	J39	J46	J45	J45	J47	J46	J47	J46	J44
MONITOR 1	P39	J43	J39	J37	J39	J39	J44	J43	J44	J36	J43	J44	J44	J44	J35	J38
MONITOR 2	P40	J36	J40	J45	J40	J40	J45	J45	J45	J38	J36	J45	J45	J45	J45	J45
LINE TEST	P41	J38	J41	J41	J41	J41	J38	J38	J41	J43	J39	J41	J41	J36	J41	J41
AUTO LINE RET IN	P42	J35	J42	J42	J42	J42	J42	J35	J42	J35	J35	J42	J42	J42	J42	J42
AUTO LINE RET OUT	P43	J40	J43	J43	J43	J43	J43	J36	J43	J39	J37	J43	J43	J43	J43	J43
LINE 1	P44	J44	J35	J35	J36	J37	J39	J44	J37	J44	J44	J36	J37	J39	J36	J37
LINE 2	P45	J45	J37	J36	J37	J36	J40	J37	J36	J37	J40	J37	J36	J40	J37	J36
LINE 3	P46	J46	J46	J46	J38	J46	J35	J46	J35	J46	J46	J35	J38	J35	J38	J35
LINE 4	P47	J47	J47	J47	J47	J35	J47	J47	J47	J47	J47	J38	J35	J38	J47	J47
D. C. TEST	P48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48	J48

Note. To set up any condition on the patch panel: Patch the plug indicated in the extreme left hand column into the jack indicated under the condition desired. For example: To set up condition B, PRINTER REC plug P35 would be inserted into J38 and PRINTER SEND plug P36 would be inserted into J44 etc.

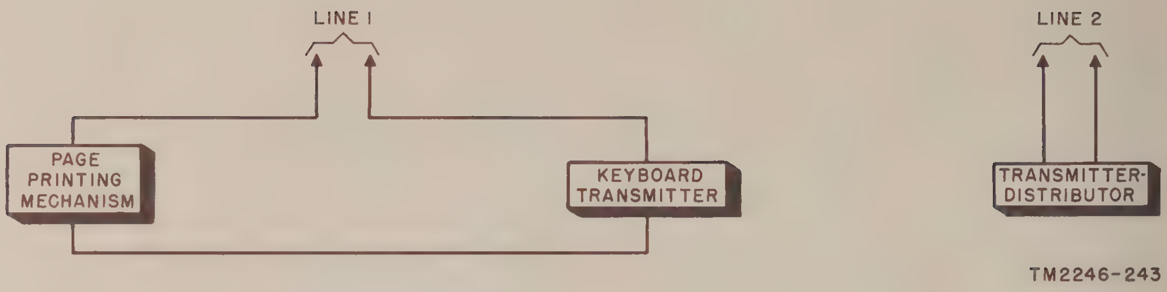

Figure 21. Block diagram, condition B.

b. Patch Panel Condition B. Patch panel condition B (fig. 21) connects the page printing mechanism and the keyboard transmitter in a half-duplex circuit on line 1 and the transmitter-distributor on a send only circuit on line 2. In this condition, tape may be perforated locally or a tape may be made of the messages transmitted from the keyboard transmitter. Connect the patch panel plugs to the jacks shown under B of the chart in *a* above.

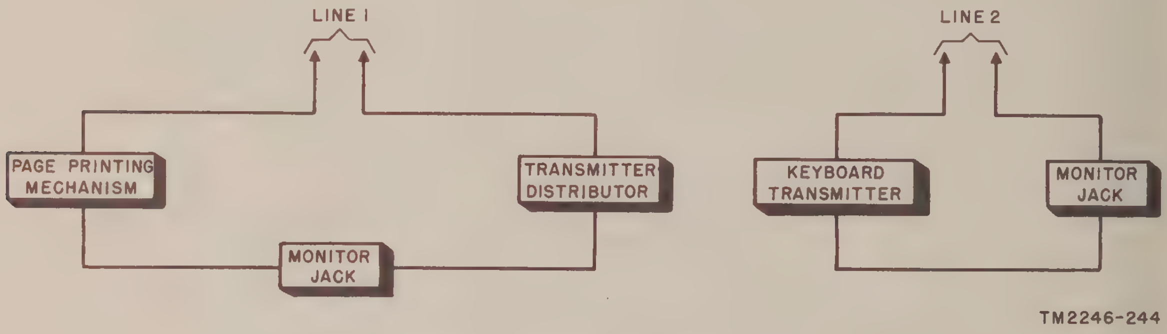

Figure 22. Block diagram, condition C.

c. Patch Panel Condition C. Patch panel condition C (fig. 22) connects the transmitter-distributor and the page printing mechanism in a half-duplex circuit on line 1 and the keyboard transmitter on line 2. Connections of the patch panel required to set up condition C are listed in *a* above.

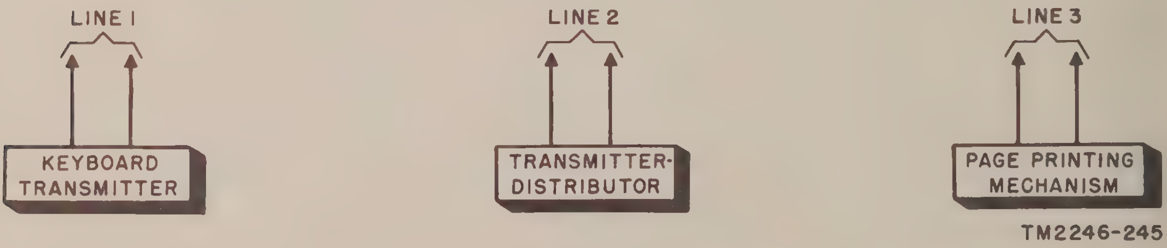

Figure 23. Block diagram, condition D.

d. Patch Panel Condition D. Patch panel condition D (fig. 23) is a full-duplex condition in which the keyboard transmitter is connected to line 1, the transmitter-distributor is connected to line 2, and the page printing mechanism is connected to line 3. Connect the plugs of the patch panel to the jacks listed under D in the chart in *a* above.

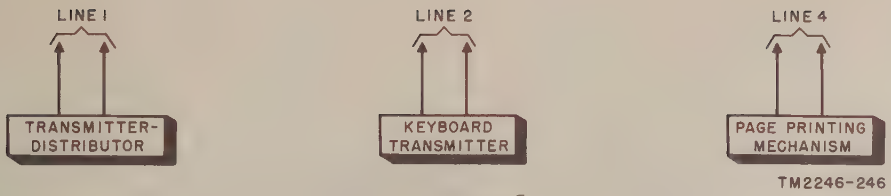

Figure 24. Block diagram, condition E.

e. Patch Panel Condition E. Patch panel condition E (fig. 24) is a full-duplex condition in which the transmitter-distributor is connected to line 1, the keyboard transmitter is connected to line 2, and the page printing mechanism is connected to line 4. Connect the plugs to the jacks under column E of the chart in *a* above to set up condition E.

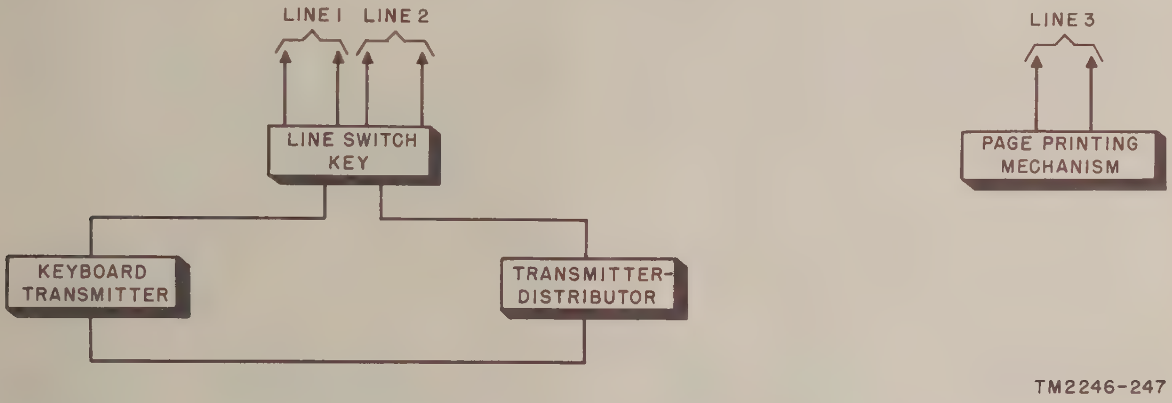

Figure 25. Block diagram, condition F.

f. Patch Panel Condition F. Patch panel condition F (fig. 25) connects the transmitter-distributor and the keyboard transmitter in a send only circuit with line 1 or line 2 as determined by the line switch key. The page printing mechanism is connected to line 3. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition F.

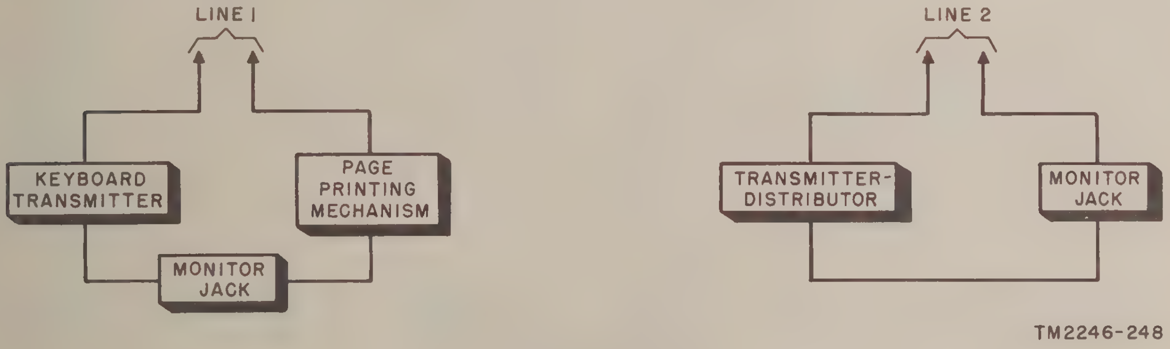

Figure 26. Block diagram, condition G.

g. Patch Panel Condition G. Patch panel condition G (fig. 26) connects the page printing mechanism, the keyboard and monitor jack No. 1 in a half-duplex circuit with line 1. It also connects the transmitter-distributor and monitor jack No. 2 to line 2. Provision is made to permit the use of the page printer to monitor the keyboard during the tape perforation or to make a page copy of a tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition G.

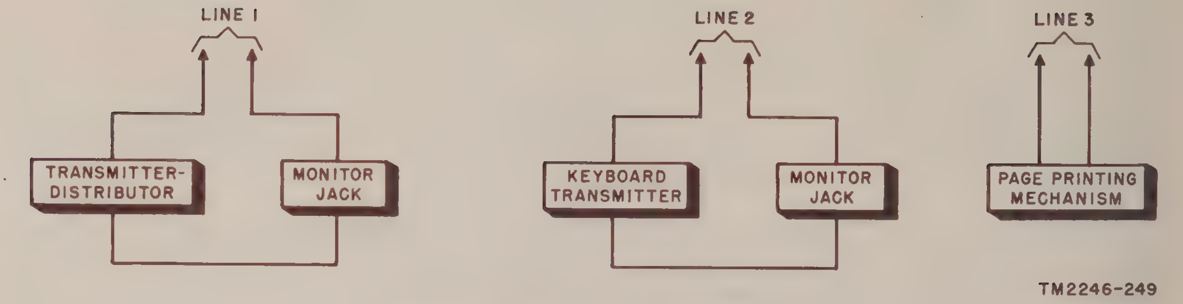

Figure 27. Block diagram, condition H.

h. Patch Panel Condition H. Patch panel condition H (fig. 27) connects the transmitter-distributor in line 1. It also connects the keyboard transmitter to line 2 and the page printing mechanism to line 3. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition H.

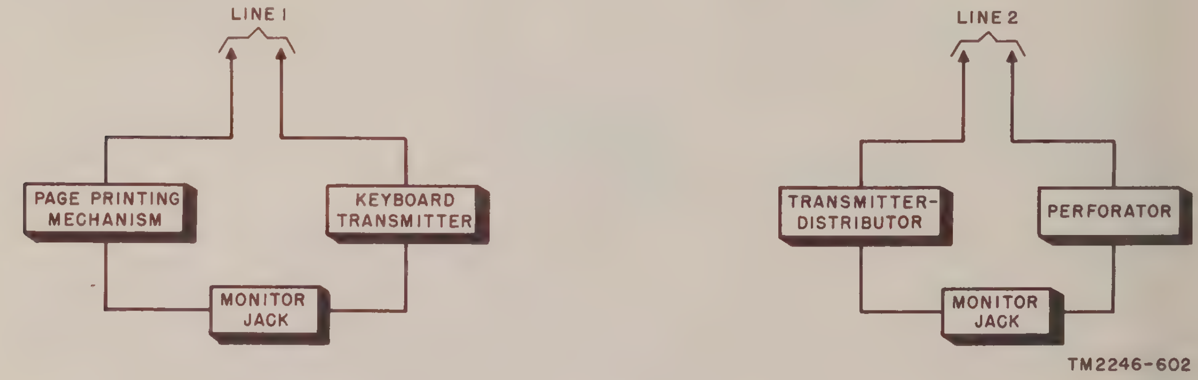

Figure 28. Block diagram, condition I.

i. Patch Panel Condition I. Patch panel condition I (fig. 28) connects the page printing mechanism and the keyboard transmitter in a half-duplex circuit on line 1 and the perforator and the transmitter-distributor in a half-duplex circuit on line 2. An external reperforator must be used when it is desired to cut tape locally. Provision is made to permit the use of the page printer to monitor the keyboard during tape perforation. The page printer will automatically return to the line at the start of an incoming message. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition I.

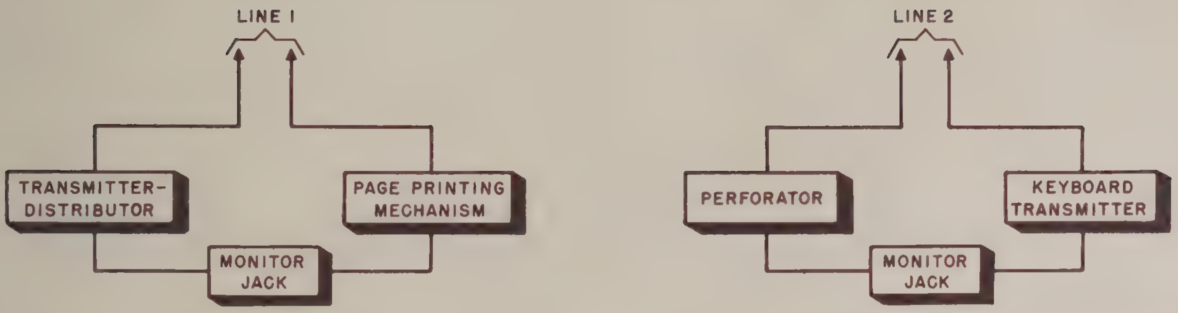

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Figure 29. Block diagram, condition J.

j. Patch Panel Condition J. Patch panel condition J (fig. 29) connects the page printing mechanism in a half-duplex circuit with the transmitter-distributor on line 1 and the perforator and keyboard transmitter in a half-duplex circuit on line 2. Provision is made to permit the use of the page printer to monitor the tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. An external reperforator must be used when it is desired to cut tape locally. Connect the patch panel as indicated by the chart in *a* above to set up condition J.

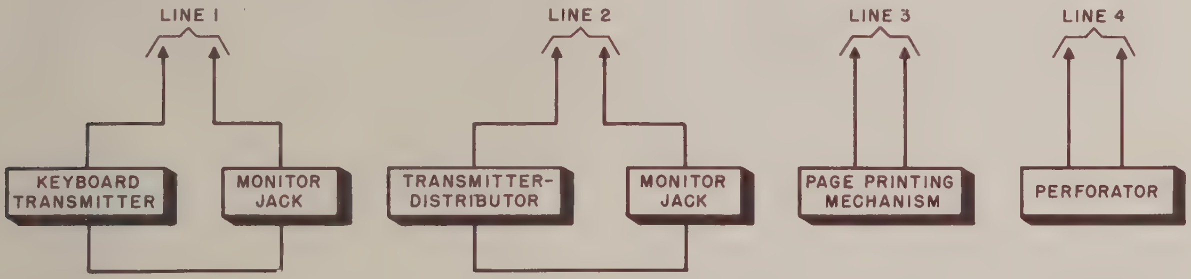

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Figure 30. Block diagram, condition K.

k. Patch Panel Condition K. Patch panel condition K (fig. 30) is a full-duplex condition in which the keyboard transmitter is connected to line 1, the transmitter-distributor is connected to line 2, the page printing mechanism is connected to line 3, and the perforator is connected to line 4. Connect the patch panel as indicated by the chart in *a* above to set up condition K.

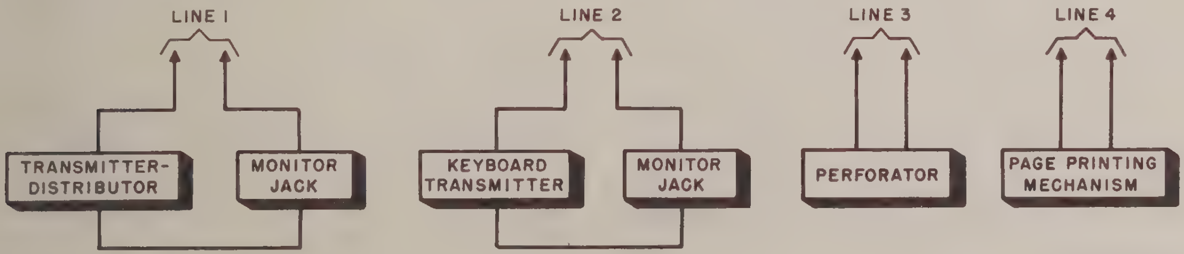

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Figure 31. Block diagram, condition L.

l. Patch Panel Condition L. Patch panel condition L (fig. 31) is a full-duplex condition in which the transmitter-distributor is connected to line 1, the keyboard transmitter is connected to line 2, the perforator is connected to line 3, and the page printing mechanism is connected to line 4. Connect the patch panel as indicated in the chart in *a* above set up condition L.

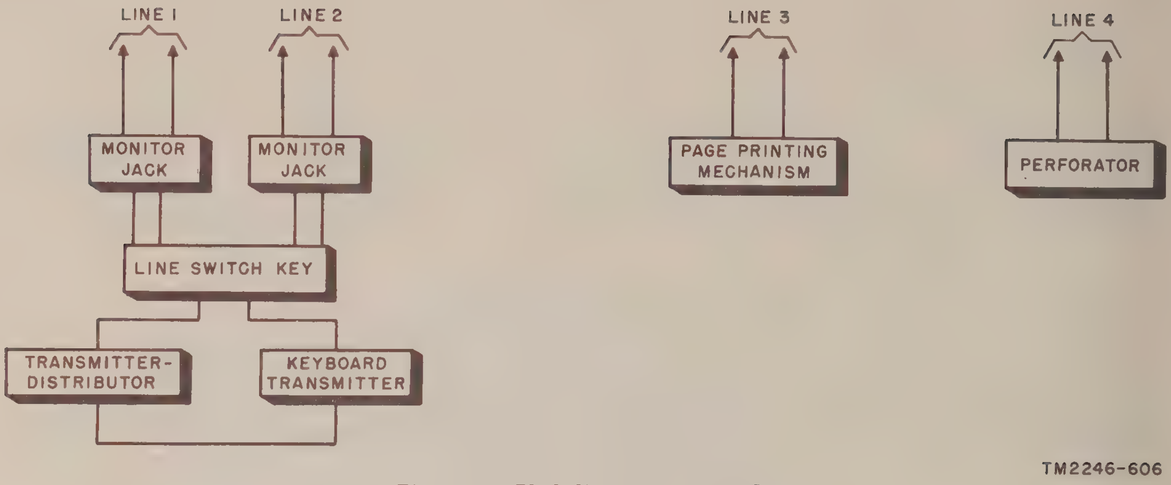

Figure 32. Block diagram, condition M.

m. Patch Panel Condition M. Patch panel condition M (fig. 32) connects the transmitter-distributor and the keyboard transmitter in a send only circuit with line 1 or line 2 as determined by the line switch key. The page printing mechanism is connected to line 3 and the perforator is connected to line 4. Connect the patch panel as indicated in the chart in *a* above to set up condition M.

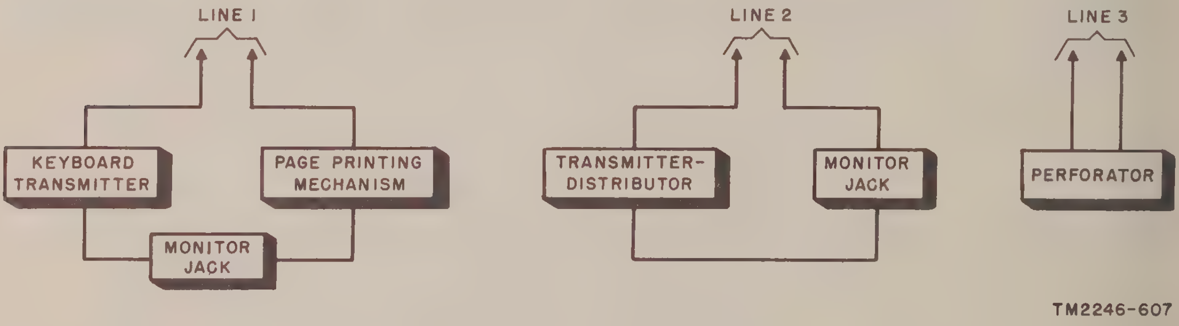

Figure 33. Block diagram, condition N.

n. Patch Panel Condition N. Patch panel condition N. (fig. 33) connects the page printing mechanism and the keyboard transmitter in a half-duplex circuit with line 1. It also connects the transmitter-distributor to line 2 and the perforator to line 3. This condition is used only when it is not desired to cut tape locally. Connect the patch panel as indicated in the chart in *a* above to set up condition N.

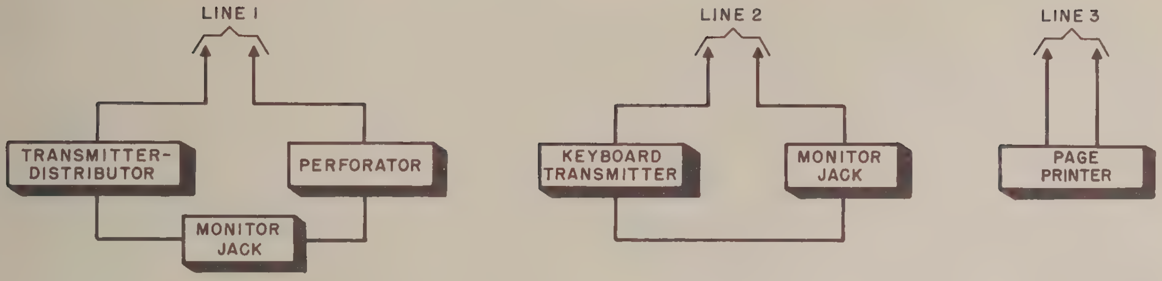

Figure 34. Block diagram, condition O.

o. Patch Panel Condition O. Patch panel condition O (fig. 34) connects the transmitter-distributor and the perforator in a half-duplex circuit with line 1. It also connects the keyboard transmitter to line 2 and the page printing mechanism to line 3. This condition is used only when it is not desired to cut tape locally. Connect the patch panel plugs as indicated in the chart in *a* above to set up condition O.

27. Signal Line Connections

Connect the signal lines to the teleprinter as follows:

a. Remove the cap nuts from the LINE 1 and LINE 2 LINE INCREASE MA potentiometers (fig. 14) on the rear control panel of the perforator. With a screwdriver, adjust both potentiometers to their maximum counterclockwise (max resistance) settings.

b. Adjust the REPERFORATOR SIGNAL switch to the 20- or 60-ma setting, whichever is used on the signal line on which the perforator is connected. Use the 60-ma setting for 30-ma polar reception.

c. Adjust the BIAS switch as required by the conditions of the line on which the perforator is connected. The upper setting of the switch is for 20-ma operation, the lower setting is for 60-ma operation, and the midpoint setting is for polar operation.

d. Turn the LINE 1 and LINE 2 switches (fig. 35) to the OFF position.

e. Adjust the page printer SIGNAL switch (fig. 13) to 20-ma or 60-ma operation, whichever is used on the signal line to which the page printer is connected. The upper setting is for 20-ma neutral and the lower setting is for 60-ma neutral or 30-ma polar operation.

f. Adjust the BIAS switch of the page printer as required by the conditions on the line to which the page printer is connected. The upper setting of the switch is for 20-ma neutral operation, the lower setting is for 60-ma neutral operation, and the midpoint setting is for polar operation.

g. Connect the signal lines to the terminals designated by the setting of the patch panel. Lines 1 and 2 have three terminals designated A, B, and C. Connect the signal lines to the A and B terminals of these lines. Lines 3 and 4 have only two terminals. Connect the signal lines to these terminals if required.

28. Circuit Lineup

a. To secure the best possible machine operation, it is necessary to adjust the teleprinter to meet the conditions of the signal line. Circuit lineup for these teleprinters normally includes adjusting the line current and rangefinder dial assemblies for the equipment at both ends of the circuit, followed by an exchange of test copy. Before the equipment is installed on the line, it is necessary for all personnel concerned to know the type of operation required, and the predetermined souce of line current.

b. The circuit from which the circuit line-up is directed is called the control station. Generally the station of higher authority is the control station. Line-up of a circuit of equal authority is normally directed by the station that has the lowest numerical designation.

c. Line current for any particular line in a teleprinter system usually is supplied by the station in the network which has the transmitting device on that line. If two or more stations have transmitting devices on the line, the station of highest authority usually supplies the power. Two or more stations may supply current when it is necessary because of excessive line leakage or other line factors. Teletypewriter Sets AN/FGC–25 (*) are designed to supply power, either as the main source of supply or on a series-aiding basis, only to line 1 or line 2. Current on line 3 or line 4 can neither be supplied nor controlled by the set.

d. Polar or neutral signals can be received by either the page printer or by the perforator, but only neutral signals can be sent from the keyboard transmitter or from the transmitter-distributor. Polar signals must be 30 ma while neutral signals may be either 20 or 60 ma.

e. Line current is normally adjusted on line 1 or line 2 as follows:

(1) Turn the perforator and page printer POWER switches (figs. 12 and 14) to the ON positions.

(2) If the set is to supply current to line 1, or line 2, or both, set the appropriate LINE switch or switches to the ON position.

(3) The control station turns its line 1 or 2 INCREASE MA potentiometer to maximum counterclockwise (max. resistance) position.

(4) Noncontrol stations turn their LINE INCREASE MA potentiometer to the maximum clockwise (min. resistance) position.

(5) The control station gradually decreases resistance until the current reaches 75-ma for 60-ma circuits or 30-ma for 20-ma circuits.

(6) Noncontrol stations then add resistance gradually to bring the current down to the predetermined level.

(7) If enough current cannot be supplied to the line in this manner, proceed as follows:

(*a*) Turn the perforator and page printer POWER switches to the OFF positions.

(*b*) Disconnect the signal line lead from the B terminal of the appropriate line and reconnect it to the C terminal. This decreases the internal resistance of the perforator by 1,000 ohms and allows more current to flow through the circuit.

(*c*) Repeat the steps directed in (3) through (6), above.

(*d*) If sufficient current cannot be attained on the signal line in this manner, another unit in the circuit will have to supply power on a series-aiding basis. This can be accomplished by having another unit in the line turn the LINE 1 or 2 INCREASE MA potentiometer counterclockwise to its maximum resistance position, turn the LINE switch to the ON position, and then adjust the LINE 1 or 2 INCREASE MA potentiometer to decrease the resistance until the proper line current is attained.

(*e*) If the current decreases instead of increasing, reverse the signal line connections.

f. The rangefinder dial assemblies are adjusted as follows:

(1) Noncontrol stations transmit repeated R and Y signal code groups. The control station then turns its rangefinder dial assembly to the maximum and minimum good copy position. If the machine continues to receive good copy when the rangefinder dial assembly is set at zero, use zero as the low reference point. Determine the midway point between the two settings and adjust the rangefinder dial assembly to this point. Both page printer and perforator rangefinders are adjusted in this manner. When the setting is complete, the control station signals the noncontrol stations with two 5-second break signals.

(2) The control station now transmits repeated R and Y signal code groups while the noncontrol stations adjust the rangefinders in the same manner as the control station described in (1) above.

(3) The stations then exchange test messages. If the messages are correctly received, the stations should be alined.

29. Changing Teleprinter Operating Speed

a. The equipment is shipped by the manufacturer with gear sets for 368.1 opm (60 wpm) installed. Gears also are provided for speed changes to 460 opm (75 wpm) and 600 opm (100 wpm).

b. To change the operating speed of the page printer. It is necessary to change only the worm gear on the shaft of the motor armature and the main shaft driven gear with which the worm gear meshes. The extra gear sets for the page printer are mounted on the worm gear cover plate and beneath the paper roller stand. The speed, in operations per minute, is stamped on the sides of the main shaft driven gears and on the cylindrical portions of the worm gears. Check both gears to make sure they are correct for the operating speed desired.

c. To change the operating speed of the perforator, it is necessary to change the worm gear of the shaft of the motor armature and the worm gear of the perforator main shaft. It is also necessary to check that the double gear for the speed desired is installed on the receiving multisolenoid function shaft and that the idler gear engages the correct surface of the double gear. The perforator 600 opm and 460 opm speed worm gears and the main shaft driven gears are mounted on the perforator base along with a 460 opm (75 wpm) and a 600 opm (100 wpm) receiving multisolenoid function shaft double gear. The perforator worm gears and the main shaft driven gears are marked the same way that the page printer gears are marked. The receiving multisolenoid function shaft double gear has the speed in operations per minute stamped on one side. Operations necessary to change the operating speed of the page printer are listed in *d* below. Operations necessary to change the operating speed of the perforator are listed in *e* below.

Note. If operation at 404 opm (66 wpm) is desired, it is necessary to obtain the proper gear sets through the usual supply channels.

d. To change the page printer operating speed use the chart below first, to determine the gears to be used for the desired operating speed. Remove the page printer worm gear as instructed in paragraph 169*a*(1) through (3). Remove the page printer main shaft driven gear as instructed in paragraph 197*a*(3). Install the new page printer main shaft driven gear as instructed in paragraph 197*b*(5). Install the new page printer worm gear as instructed in paragraph 169*b*(6) through (8).

Page Printer Gear Chart

Operating speed (wpm)	Worm gear marking	Main shaft driven gear marking
60	368.1 opm	368.1 opm.
66	404 opm	404 opm.
75	460 opm	460 opm.
100	600 opm	600 opm.

e. To change the perforator operating speed, use the following chart to determine which gears are to be used to obtain the desired operating speed. For identification purposes, the receiver multisolenoid function shaft double gears have the operating speeds stamped on the side opposite the clutch teeth. If these stampings are not legible, the double gears can be identified by measuring the outside diameters or by counting the number of teeth on each gear. The 368.1–460 opm double gear has outside diameters of 1¼ and 1½ inches and has 27 and 33 gear teeth. The 460 to 600 opm double gear has outside diameters of 1½ and 1⅞ inches and has 33 and 43 gear teeth. Change the gears as follows:

(1) Remove the perforator worm gear (pars. 240*a* and 169*a*(3)).

(2) Remove the perforator main shaft driven gear (par. 271*a*(4)).

(3) If a change is required by the chart for the new operating speed, remove the idler gear and interchange its position with that of the spacer (par. 273*a*(2) and (4)).

(4) If a change is required by the chart for the new operating speed, remove the receiver multisolenoid shaft double gear (par. 274*a*(2)) and install the new gear (par. 274*b*(7) and (8)).

(5) Install the correct idler gear (par. 273*b*(2) and (4)) and make sure the idler gear meshes with the correct surface of the double gear as directed in the chart below.

(6) Install the correct perforator main shaft driven gear (par. 271*b*(6)).

(7) Install the correct perforator worm gear (pars. 169*b*(6) and 240*b*).

Perforator Gear Chart

Operating speed (wpm)	Worm gear marking	Main shaft driven gear marking	Idler gear marking	Double gear marking
60	368.1 opm	368.1 opm	Small	368.1–460 opm.
66	404 opm	404 opm	Small	368.1–460 opm.
75	460 opm	460 opm	Large or Small	368.1–460 opm. or 460–600 opm.
100	600 opm	600 opm	Large	460–600 opm.

Note. The idler gear and double gear changes are required to keep the speed of the receiving multisolenoid function shaft at 125 wpm.

CHAPTER 3
OPERATION

Section I. CONTROLS

30. Teletypewriter TT–117/FG and Teletypewriter TT–119/FG Controls

The following charts list all controls used in operation of the TT–117/FG and TT–119/FG. Both units include a keyboard transmitter and a page printer. Operating personnel should become thoroughly familiar with the location and operation of each control before attempting to operate the equipment.

a. Keyboard Transmitter Controls (figs. 635 and 636).

Control	Location	Function
MOTOR switch	Left side of keyboard guard	Used to turn motor on and off for initial starting and complete shutdown of the teleprinter.
LIGHT switch	Left side of keyboard guard	Used to turn copy lamp on and off.
SEND-LOCK switch	Right side of keyboard guard	In the LOCK position, prevents keyboard transmission, thereby preventing accidental sending. In the SEND position, allows transmission.
LINE BREAK switch	Right side of keyboard guard	When held at BREAK, opens signal line. Used to start motors following a motor stop code group.
End-of-line indicator light	Right side of keyboard guard	Lights when the carriage reaches the 66th space to indicate that end of the line is near.
FIGS key	Bottom row, extreme left-hand end of keyboard.	When struck, shifts the platen to upper-case position to allow typing of numerals, punctuation marks, and other characters or performance of functions designated above the letters on the alphabet keys.
LTRS key	Bottom row, third from right-hand end of keyboard.	When struck after use of FIGS key, returns platen to lower-case position to allow typing of letters. Has no effect except when struck after FIGS has been struck.
LINE FEED key	Bottom row, second from right-hand end of keyboard.	When struck, moves the paper up one or two line spaces on the platen depending on the position of the single double line feed lever.
CAR. RET. key	Middle row, extreme right-hand end of keyboard.	When struck, returns the carriage (type basket) to the extreme left margin of paper.
BELL key	Middle row, second from left-hand end of keyboard.	When struck, after first striking the FIGS key, rings the signal bell to call operator's attention.
STOP key	Middle row, fifth from right-hand end of keyboard.	When struck, after first striking the FIGS key, turns off the motor to place machine on a standby basis.
REPEAT key	Top row, extreme right-hand end of keyboard.	When the repeat key together with any character or function key except CAR. RET. are struck and held down, the character or function is repeated until the repeat key is released.
Alphabet keys	Keyboard	When struck, each alphabet key causes the transmission of a code group which causes the printing of the letter, punctuation mark, or symbol shown on the key top.
Blank key	Bottom row, extreme right-hand end of keyboard.	Transmits blank code group used in message headings.

a. Keyboard Transmitter Controls—Continued

Control	Location	Function
Space bar	In front of bottom row of keys	When struck, causes carriage to move one space to the right without printing, permitting spacing between words in a message.
Tab crank arm	At left of tabulator mechanism	When pulled forward, allows the operator to set the tab set levers.
Tab set levers	Spaced along the tabulator mechanism above the keyboard.	When pulled down and forward, causes tabulating action in response to SPACE-REPEAT code impulses from the keyboard provided the tabulator locking lever is in the operative position.
Tabulator locking lever	At the right side of the tabulator mechanism.	When pulled forward and up, causes carriage to stop at present tab set levers. Has no effect in the down position.
Character counter	Above the top row of keys	Indicates the number of code groups perforated in the tape since the CAR. RET. key was last depressed.

b. Page Printer Controls (figs. 37 and 38).

Control	Location	Function
Platen crank	Left side of page printer	When rotated counterclockwise, it rolls the paper from the platen so the message can be torn off.
Single-double line feed lever	At left of platen assembly	In forward position, it causes the platen to move one space at line feed operation. In the rear position, it causes the platen to move two spaces at the line feed operation.
Pressure roller lever	At right of platen assembly (fig. 44).	When pulled forward, releases pressure on the paper to allow straightening of paper or use of sprocket feed paper. In the rear position, presses the paper tightly against the platen.
Platen lever latch	At right of platen assembly (fig. 39).	Locks the pressure roller lever in either the applied or released position.
Sprocket cam plate	At both ends of the platen	Feeds out the sprocket feed pins for use with sprocket-fed forms.
Manual space push button	Behind right side of platen assembly (fig. 39).	When depressed, causes the carriage to move to the right.
Manual CAR. RET. button	On dust cover at upper right of keyboard.	When depressed, causes the carriage to return to the left margin.
Manual LTRS button	On dust cover at upper left of keyboard.	When depressed after receiving the FIGS code group, causes platen to shift to the letters position.
Paper roller latch	On the right side of the paper roller stand (fig. 39).	When depressed, releases paper roller shaft to enable the operator to change the paper roll.

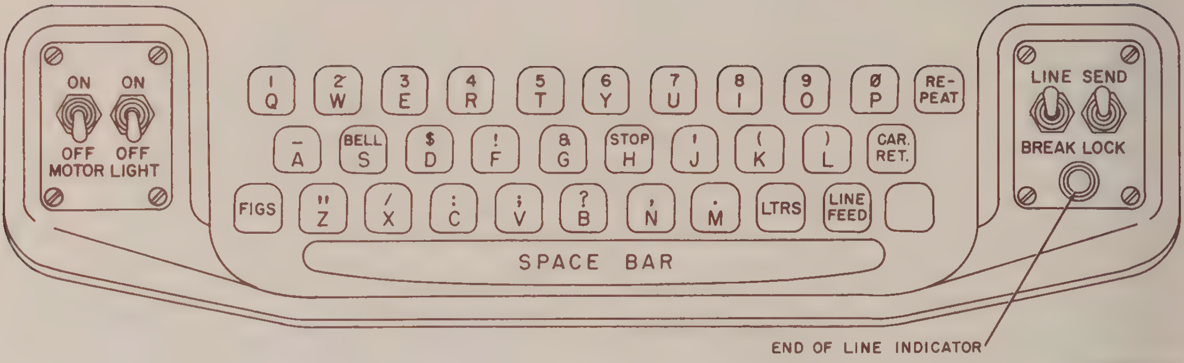

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Figure 35. Keyboard transmitter controls.

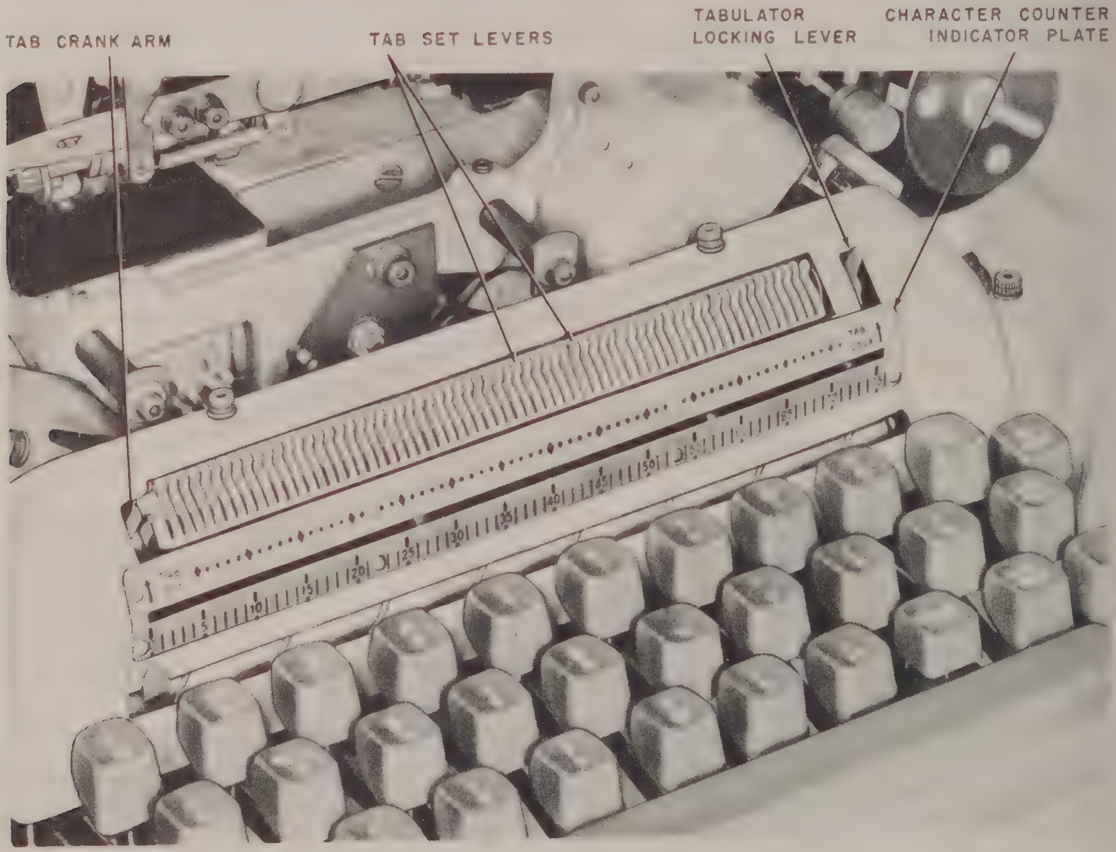

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Figure 36. Tabulator controls.

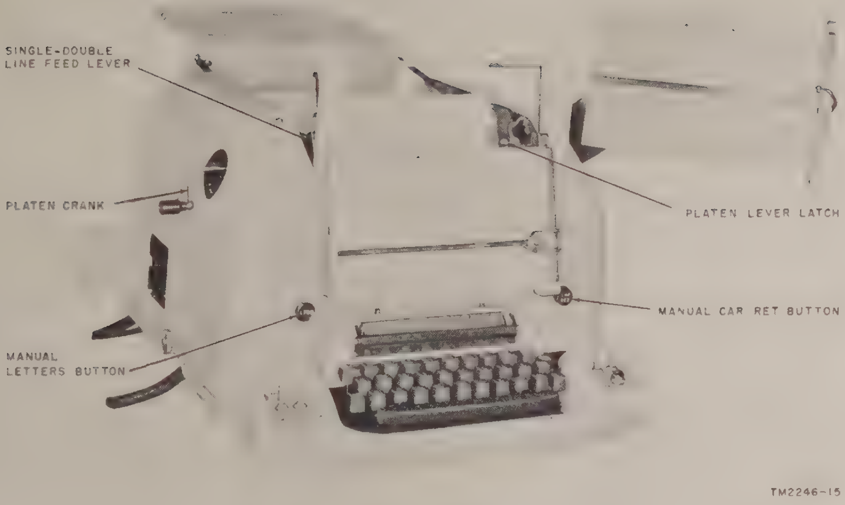

Figure 37. Page printer controls.

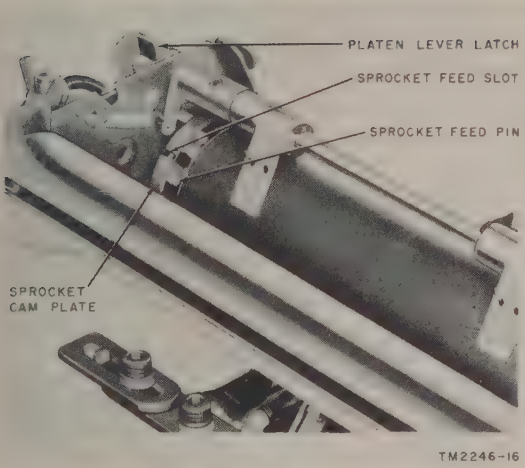

Figure 38. Sprocket feed control.

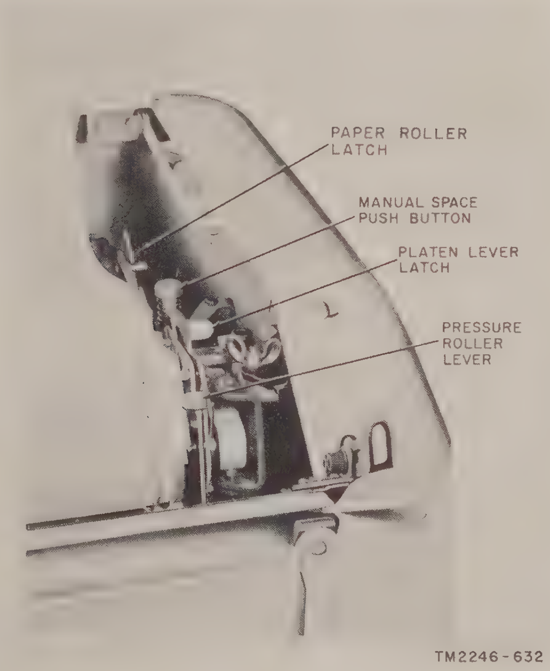

Figure 39. Controls at right side of platen.

31. Reperforator-Transmitter TT–178/FG and Reperforator-Transmitter TT–179/FG Controls

The following charts list the location and function of all controls used in operation of the TT–178/FG and TT–179/FG. Each of these units include a transmitter distributor and a perforator.

a. Transmitter-Distributor Controls (fig. 40).

Control	Location	Function
STOP-START lever	Left front side of the transmitter-distributor cover.	START position: Allows a message to be transmitted from the transmitter-distributor. STOP position: Stops transmission from the transmitter-distributor. FEED RETRACT—Depresses feed pins and permits a tape to be inserted into the transmitter-distributor.
Tight-tape lever	In front of the transmitter-distributor.	Stops transmission when tape becomes tight. When tape is slack, it allows unit to transmit.
Tape-out lever	Under tape cover	Lever rises, stopping transmission when the end of the tape is reached.
Tape cover latch	At right of tape cover	When depressed, it raises the cover to permit tape adjustment and installation.

b. Perforator Controls (fig. 41).

Control	Location	Function
Keyboard control switch	At left of switch plate on front of perforator.	KEYBD, the left position of the switch, controls the sending of sequential signals from the keyboard transmitter, KEYBD AND TAPE, the enter position of the switch, controls sending of both simultaneous and sequential signals from the keyboard transmitter. TAPE, the right position of the switch, controls sending of simultaneous signals from keyboard transmitter to the perforator.
Perforator control switch	At the left center of switch plate at the front of the perforator.	KEYBD, the left position of the switch, enables the perforator to receive simultaneous signals. OFF, the center position of the switch, cuts off the reception of the perforator. REPERF, the right position of the switch, enables the perforator to receive sequential signals.
MOTOR switch	In center of switch plate at front of the perforator.	Turns the perforator motor on or off.
Line switch key	At the right center of the switch plate at the front of the perforator.	LINE 1, the left position of the switch, places line 1 in series with the equipment that is patched into LINE TEST SW on the patch panel. TEST, the center position of the switch, places the equipment that is patched into LINE TEST SW on the patch panel in series with the local circuit. LINE 2, the right position of the switch, places line 2 in series with the equipment that is patched into LINE TEST SW on the patch panel.
ALR MONITOR Switch	At the right of the switch plate at the front of the perforator.	LINE 1, the left position of the switch, inserts the automatic line return into the line 1 signal circuit, enables the page printing mechanism to record the line 1 signal. OFF, the center position of the switch, takes the monitor out of the circuit. Line 2, the right position of the switch, inserts the automatic line return into the line 2 signal circuit, enabling the page printing mechanism to record the line 2 signal.
Manual tape feed out lever	At right of perforator above switches.	When turned to left, causes the message tape to feed out of the perforator.
Tape back space lever	At left front cover of perforator inside dust cover.	When pressed, spaces tape to the right to permit correction of errors.

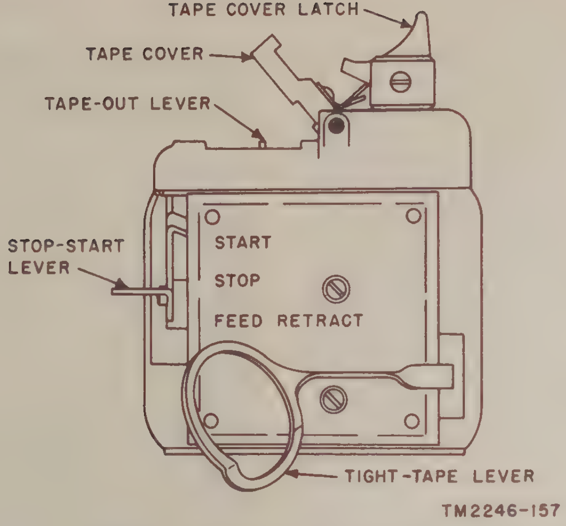

Figure 40. Transmitter-distributor controls.

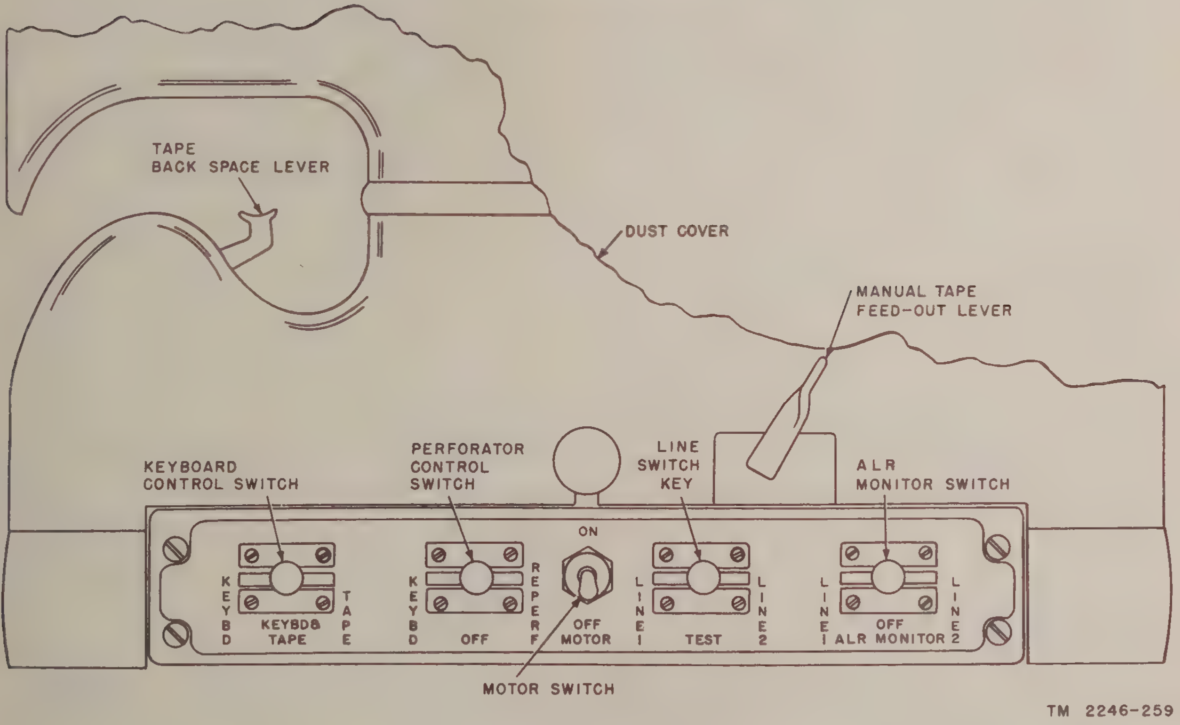

Figure 41. Perforator controls.

32. Preliminary Starting and Checking Procedures

a. Loading and Checking Roll Paper. The page printer dust cover need not be removed before loading or unloading a paper roll or before checking the amount of paper on the roll.

(1) *Loading roll paper.*

(*a*) Unlatch copy holder from dust cover by pulling top edge of copy holder away from the dust cover.

(*b*) Move latch buttons (located on both sides of dust cover window) away from each other to release dust cover window and move the window section forward.

(*c*) Move top of the cover up and then back, to its rearmost position.

(*d*) Remove the paper roller shaft from its mounting slots in the paper roller stand by pressing down on the paper roller latch and pulling the paper roller shaft upward.

(*e*) Insert the shaft (fig. 42) into a paper roll.

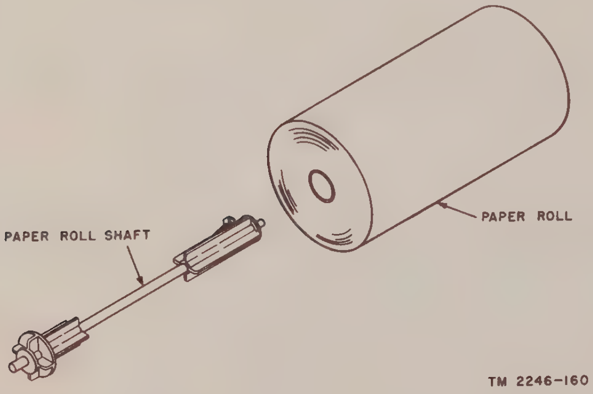

Figure 42. Paper roller shaft and paper roll.

(*f*) Replace the paper roller shaft in the slots so that the paper unrolls from the bottom of the roll.

(*g*) Feed the paper into the rear of the platen assembly, threading it between the platen and the platen pressure roller. Turn the platen crank (fig. 37) counterclockwise to turn the paper around the platen until several inches of paper stand up, almost vertically, in front. Operate the pressure roller lever and center the paper on the platen, making sure it is feeding in straight and free from creases, twists, or wrinkles.

(*h*) Crank the paper until the loose end extends well above the dust cover.

(*i*) Close and latch the top access door and top access window, allowing the paper to extend out over the top. Latch the copy holder.

(2) *Checking paper.*

(*a*) Check the paper during operation of the page printer to make sure it is properly centered, free from creases or wrinkles, and that it leaves the machine through the paper exit slit in the top of the dust cover. When it is necessary to straighten the paper, push downward on the pressure roller lever at the right end of the platen, center and straighten the paper, and return the pressure roller lever to its original position.

(*b*) When the end of the paper is almost reached, a red stripe will appear at the center or side of the paper. This is a warning that the end of the paper roll is near and that the roll should be replaced before the receipt of another message. This warning is given in time so that the message being received can be finished and a new supply of paper can be obtained.

b. Installing Fanfold Paper in Page Printer (fig. 43).

(1) Place a box of fanfold paper on the fanfold form rack, provided under the table top directly in front of the operator.

(2) Thread the loose end of the paper at the top of the box through the guide chute in the table.

(3) Bring the paper over the top of the page printing mechanism and thread it into the rear end of the platen assembly, between the platen and the pressure roller. Straighten the paper and replace the dust cover (*a* above).

c. Installing Sprocket-Fed Forms.

(1) Insert a screwdriver or like object into a slot in the sprocket cam plate (fig. 38) at the ends of the platen and turn the sprocket cam plate to extend the sprocket feed pins.

(2) Release the pressure roller lever

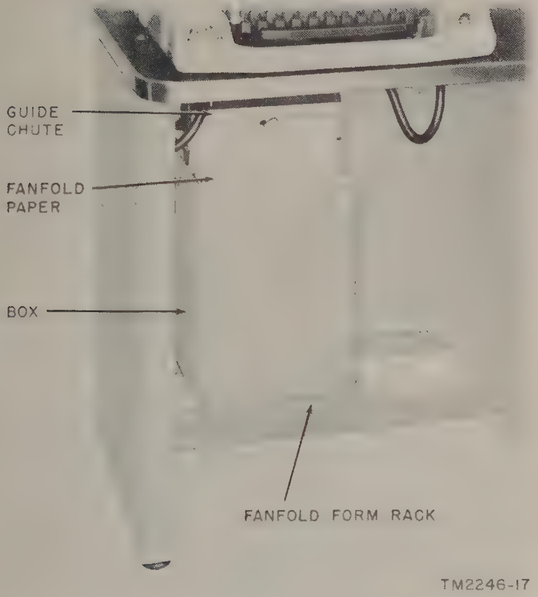

Figure 43. Fanfold forms placed in table.

(3) Install the pack of fanfold sprocket-fed forms in the table as directed in *b*(1) and (2) above.

(4) Thread the top sprocket-fed form into the platen (fig. 44), making sure the sprocket feed pins mesh properly with the perforations at the edges of the paper.

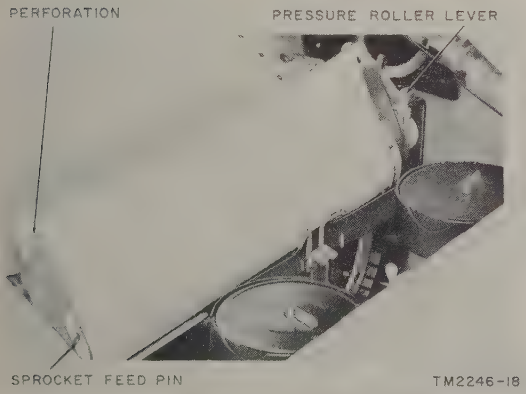

Figure 44. Sprocket-fed form threaded into platen.

d. Installing Tape in Perforator. The perforator dust cover is designed to permit the installation of a paper tape roll (fig. 45) onto the tape reel without removing the dust cover. To load a tape roll, perform the following steps.

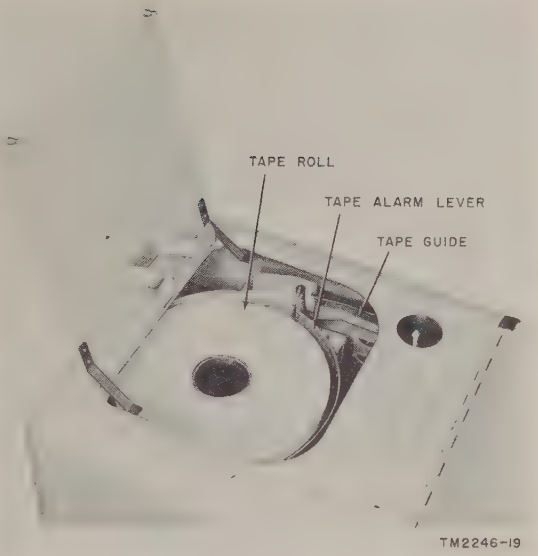

Figure 45. Perforator tape roll mounted on tape reel.

(1) Move the top rear door of the perforator upward and open the front access door of dust cover.

(2) Pull the tape alarm lever away from the hub of the tape reel, place the tape roll on the hub; then release the tape alarm lever allowing the end of the tape alarm lever to rest against the tape roll. Guide the end of the tape through the tape guide.

(3) Feed the end of the tape from the tape guide (fig. 46), into the tape chute, under the type wheel, and into the slot in the code die assembly. Press down on the tape retainer assembly and feed the tape end under the roller and tape tear wire and out through the opening in the dust cover.

e. Changing Inking Ribbon on Page Printer (fig. 47). It is not necessary to remove the dust cover from the page printer when replacing the inking ribbon. Opening the top access door and top access window allows sufficient room for inking ribbon changing. The carriage may be spaced to the center of the opening by depressing the manual space push button.

(1) Remove the old inking ribbon as follows:

(*a*) Wind one of the printing ribbon spools by hand twirling the appropriate ribbon spool lock until the other printing ribbon spool is empty.

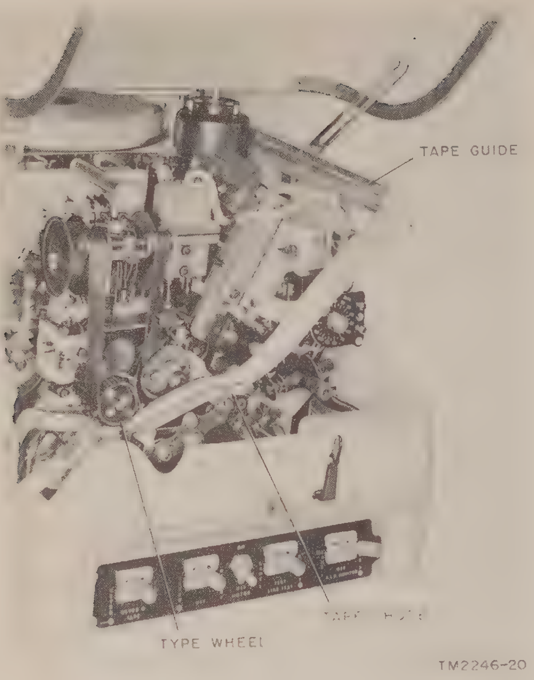

Figure 46. Tape feed into perforator tape chute.

(*b*) Remove the old inking ribbon from the slots in the ribbon guide.

(*c*) Turn the ribbon spool locks to the upright (unlocked) positions.

(*d*) Depress both ribbon sensing levers. Lift out the empty printing ribbon spool and detach the empty inking ribbon from it. Save the empty printing ribbon spool to wind the new inking ribbon. Release the ribbon sensing levers.

(*e*) Lift out the full printing ribbon spool and discard it and the worn inking ribbon.

(2) Install a new inking ribbon as follows:

(*a*) If the new inking ribbon must be turned counterclockwise to be unwound (when viewed from the top), place the new inking ribbon in the right-hand ribbon drive mounting. If it must be turned clockwise to be unwound (when viewed from the top), place it in the left-hand ribbon drive mounting. Align the two holes in the printing ribbon spool with the lugs on the ribbon spool driven shaft collar.

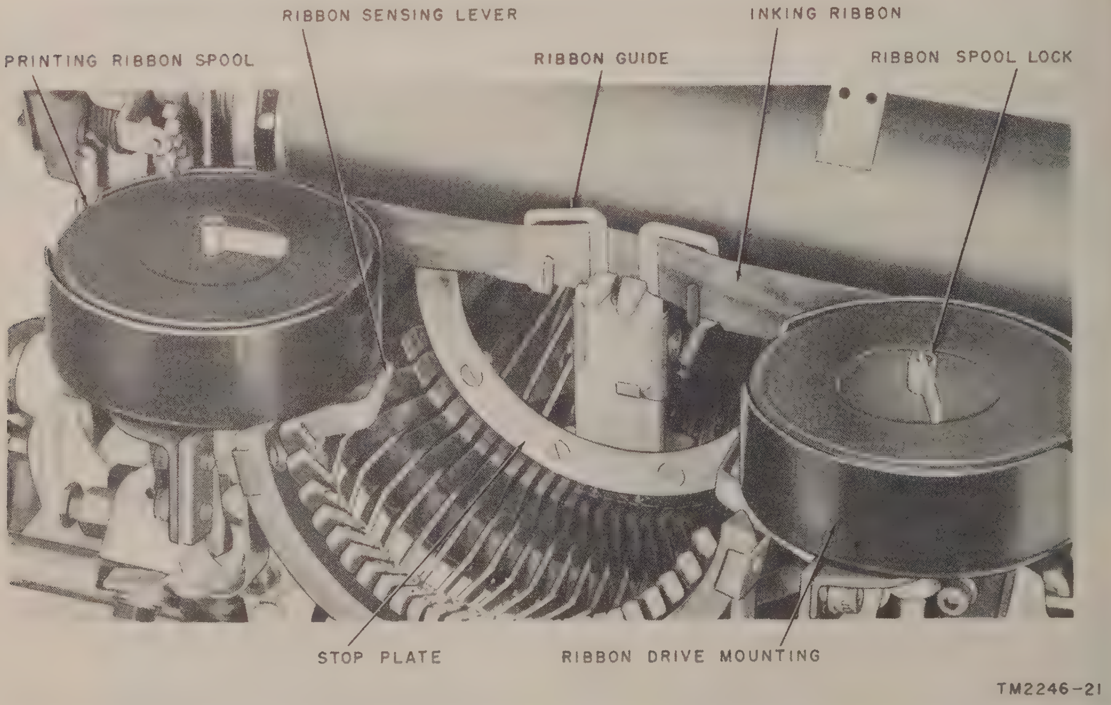

Figure 47. Page printer inking ribbon mechanism.

(*b*) Pull about 12 inches of inking ribbon through the slotted opening in the rear of the ribbon drive mounting and fasten the loose end of the inking ribbon to the empty printing ribbon spool. Choose the spearhead fastener which will allow the inking ribbon to wind, turning in the same direction as the full printing ribbon spool turns when it unwinds. Stab the spearhead through the inking ribbon and 1 inch from the end. Be sure the ribbon is not twisted at any point between the two printing ribbon spools.

(*c*) Depress both ribbon sensing levers. Place the empty printing ribbon spool in the ribbon drive mounting as instructed for the full printing ribbon spool, threading the inking ribbon through the slotted opening at the back of the ribbon drive mounting. Release the ribbon sensing levers.

(*d*) Insert the inking ribbon in the slots in the ribbon guide, making sure it is flat and free from twists.

(*e*) Insert the inking ribbon in the two slots, one on the back of each ribbon drive mounting. Pass the inking ribbon in front of the stop plate.

(*f*) Turn the two ribbon spool locks to the horizontal (locked) position.

(*g*) Tighten the inking ribbon by winding manually. Turn one printing ribbon spool with one hand while holding the other rigid.

(3) After each inking ribbon installation, and at reasonable intervals thereafter, make the following inking ribbon checks.

(*a*) Inking ribbon must be taut and free of twists, wrinkles, creases, holes, and tears. It must lie flat in the slots on the backs of the ribbon drive mountings and in the ribbon guide.

(*b*) Both printing ribbon spools must turn in the same direction while the page printing mechanism is typing.

(*c*) Both printing ribbon spools must be seated horizontally in the ribbon drive mountings, ribbon spool locks set horizontally.

(*d*) Both printing ribbon spools must reverse direction when the unwinding printing ribbon spool is emptied.

f. Changing Inking Ribbon on Perforator (fig. 48). Replace the inking ribbon when the fabric becomes worn or the printed characters lack the proper density for easy reading. Use the following procedure:

(1) Wind the inking ribbon completely on one ribbon spool.

(2) Move the ribbon spool locks on the ends of the ribbon spool shaft to a horizontal position. Push back on the sensing lever, and pull forward on the top of the ribbon retainer lever of the empty ribbon spool.

(3) Pull the ribbon spool from the ribbon spool shaft and detach the inking ribbon from it. Remove the full ribbon spool from the opposite side the same way.

(4) Attach the new inking ribbon to the empty ribbon spool by piercing the spearhead of the ribbon spool into the inking ribbon about 1 inch from the loose end.

(5) With the spool lock in the horizontal position, the sensing lever pushed back,

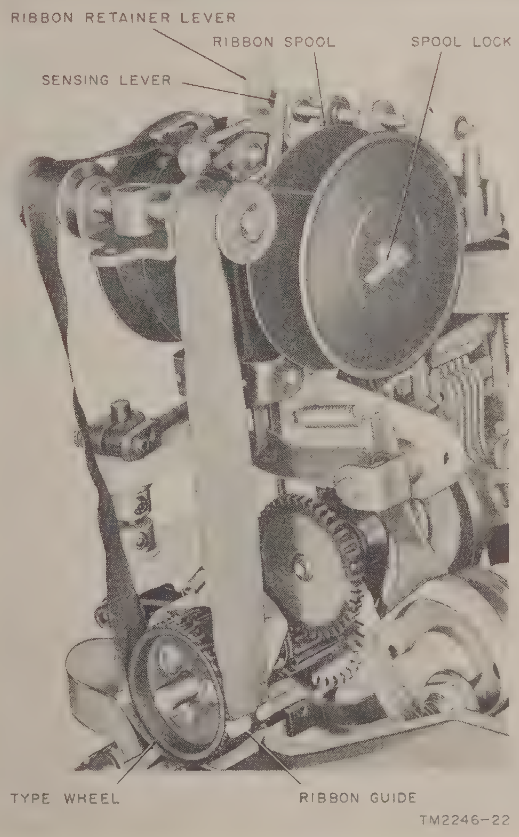

Figure 48. Perforator inking ribbon mechanism.

and the top of the ribbon retainer lever pulled forward, install the new ribbon spool on the ribbon spool shaft. Be sure the slots in the ribbon spool engage the lugs on the ribbon feeding detent wheel and that the inking ribbon feeds from the top of the ribbon spool.

(6) Leave a long loop in the inking ribbon and install the ribbon spool on the opposite side in the same way. Turn the spool locks at the ends of the ribbon spool shaft to the vertical position. Pass the inking ribbon over the ribbon rollers in front of each ribbon spool.

(7) Give the inking ribbon a half twist, pass it under the type wheel, and slip it into the slots of the ribbon guide on either side of the type wheel. Turn one of the ribbon spools to pull inking ribbon taut.

33. Types of Operation

The type of operation of the teleprinter is determined by the patch panel connections. There are 15 typical patch panel conditions, one of which may be set up in the equipment. It is necessary for the operator to know which condition is set up in the unit, since the positioning of the control switches on the switch plate at the rear of the perforator varies with each condition. Paragraph 34 contains charts which give the detailed switch settings for each patch panel condition. To determine which switch settings to use, consult the chart for the installation arrangement that applies to the equipment, locate the type of operation desired, and set the switches as described in the chart. A line in the chart indicates that the position of the switch concerned does not affect the operation desired.

Note. The perforator control switches may be locked in any one of their three positions by turning the red portion of the switch arm clockwise. To release the switch, turn the portion of the switch arm counterclockwise.

34. Switch Settings for Patch Panel Conditions

a. Patch Panel Condition A. The following chart describes the switch settings for patch panel condition A.

Patch Panel Condition A

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to or receive from line 1 with the keyboard transmitter, the page printing mechanism and the perforator receiver.	SEND	STOP	KEYBD	REPERF	LINE 1	LINE 1.
Send to or receive from line 2 with the keyboard transmitter, the page printing mechanism and the perforator receiver.	SEND	STOP	KEYBD	REPERF	LINE 2	LINE 2.
Send to or receive from line 1 or line 2 with the transmitter-distributor, the page printing mechanism and the perforator receiver.	LOCK	START [a]	KEYBD	REPERF	LINE 1 or LINE 2.	LINE 1 or LINE 2.
Prepare tape locally while line 1 or line 2 is held closed through the automatic line return. Local page copy available.	SEND	STOP	KEYBD & TAPE	KEYBD	TEST [b] or TEST [b].	LINE 1 or LINE 2.
Send from the transmitter-distributor to the page printing mechanism and the perforator receiver while the selected line is held closed through the automatic line return. No transmission to line.	SEND	START [a]	KEYBD	REPERF	TEST [b] or TEST [b].	LINE 1 or LINE 2.
Prepare a local page copy using the keyboard transmitter while the selected line is held closed through the automatic line return. No transmission to line.	SEND	STOP	KEYBD	KEYBD	TEST [b] or TEST [b].	LINE 1 or LINE 2.
Prepare tape locally while sending from the transmitter-distributor or receiving line 1 or 2 on the page printing mechanism.	LOCK	START [a]	TAPE	KEYBD	LINE 1 or LINE 2.	LINE 1 or LINE 2.

---

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 36*c* to set up the automatic line return.

b. Patch Panel Condition B. The following chart describes the switch settings for patch panel condition B.

Patch Panel Condition B

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from keyboard transmitter to page printing mechanism and line 1.	SEND		KEYBD	OFF		
Send from transmitter-distributor to line 2.		START [a]				
Prepare tape locally while sending to line 1 from the keyboard transmitter.	SEND		KEYBD & TAPE.	KEYBD		
Prepare tape locally. Receive line 1 on page printing mechanism.			TAPE	KEYBD		
Prepare a tape copy of line 1 message.			KEYBD	REPERF		

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

c. Patch Panel Condition C. The following chart describes the required switch settings for patch panel condition C. A monitor copy, either page or tape, may be obtained of all messages sent from the keyboard transmitter to line 2 by placing the receive plug of auxiliary equipment in the MONITOR 2 jack.

Patch Panel Condition C

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to or receive from line 1 with the page printing mechanism and the transmitter-distributor.		START [a]	KEYBD	KEYBD		
Send from keyboard transmitter to line 2.	SEND		KEYBD or KEYBD & TAPE.	OFF		
Prepare tape locally without transmitting to the line.			TAPE	KEYBD		
Simultaneously prepare locally and transmit to line 2 from the keyboard transmitter.	SEND		KEYBD & TAPE.	KEYBD		
Receive tape copy of line 1 message.			KEYBD	REPERF		

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

d. Patch Panel Condition D. Messages from the line may be received by the page printer mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition D.

Patch Panel Condition D

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from keyboard transmitter to line 1.	SEND		KEYBD			
Send from transmitter-distributor to line 2.		START [a]				
Prepare tape locally			TAPE	KEYBD		
Send from keyboard transmitter to line 1 and prepare tape locally at the same time.	SEND		KEYBD & TAPE.	KEYBD		
Receive tape copy of line 3 message.			KEYBD	REPERF		

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

e. Patch Panel Condition E. Messages may be received from the line at all times by the page printing mechanism without special switch settings. The following chart describes the required switch settings for patch panel condition E.

Patch Panel Condition E

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from transmitter-distributor to line 1.		START [a]	KEYBD	KEYBD		
Send from keyboard transmitter to line 2.	SEND		KEYBD	KEYBD		
Cut tape locally without transmission to the line.	SEND		TAPE	KEYBD		
Send from keyboard transmitter to line 2 and cut tape locally.	SEND		KEYBD & TAPE.	KEYBD		
Receive tape copy of line 4 message.			KEYBD	REPERF		

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

f. Patch Panel Condition F. Messages from the line may be received by the page printer mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition F.

Patch Panel Condition F

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from keyboard transmitter to line 1 or line 2.	SEND	STOP	KEYBD	KEYBD	LINE 1 or LINE 2.	
Send from transmitter-distributor to line 1 or line 2.	LOCK	START [a]	KEYBD	KEYBD	LINE 1 or LINE 2.	
Cut tape locally without transmitting to the line.	LOCK	STOP	TAPE	KEYBD		
Use the keyboard transmitter to cut tape locally and send from transmitter-distributor to line 1 or line 2.	LOCK	START [a]	TAPE	KEYBD	LINE 1 or LINE 2.	
Cut a tape of messages sent from either transmitter to the line.	SEND	START [a]	KEYBD	REPERF	LINE 1 or LINE 2.	

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

a. Patch Panel Condition G. The following chart describes the required switch settings for patch panel condition G.

Patch Panel Condition G

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from keyboard transmitter to page printing mechanism and line 1.	SEND	STOP	KEYBD	OFF	LINE 1	LINE 1.
Send from transmitter-distributor to line 2. Independent of line 1 operation.		START [a]			LINE 1 or TEST.	LINE 1.
Prepare tape locally while receiving from line 1 on the page printer mechanism.	LOCK	STOP	TAPE	KEYBD	LINE 1	LINE 1.
Send from keyboard transmitter to page printing mechanism and line 1, while preparing tape locally. Send from transmitter-distributor to line 2.	SEND	START [a]	KEYBD & TAPE	KEYBD	LINE 1	LINE 1.
Prepare tape locally and monitor copy on the page printing mechanism with the automatic line return set on line 1. No transmission to line.	SEND		KEYBD & TAPE	KEYBD	TEST[b]	LINE 1.
Receive tape copy of line 1 messages.			KEYBD	REPERF	LINE 1	LINE 1.

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 36c to set up the automatic line return.

h. Patch Panel Condition H. Messages from the line may be received by the page printer mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition H.

Patch Panel Condition H

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from transmitter-distributor to line 1.		START[a]	KEYBD	KEYBD		
Send from keyboard transmitter to line 2.	SEND		KEYBD	KEYBD		
Prepare tape locally	LOCK	STOP	TAPE	KEYBD		
Send from keyboard transmitter to line 2 and prepare tape locally.	SEND		KEYBD & TAPE	KEYBD		
Receive tape copy of line 3 message.			KEYBD	REPERF		

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

i. Patch Panel Condition I. The following chart describes the switch settings for patch panel condition I. Local perforation of tape is possible if an external reperforator is plugged in the MONITOR 2 jack at the rear of the perforator.

Patch Panel Condition I

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to and receive from line 1 with the keyboard transmitter and the page printing mechanism.	SEND		KEYBD	REPERF	LINE 1	LINE 1.
Send to and receive from line 2 with transmitter-distributor and perforator.		START[a]	KEYBD	REPERF	LINE 1 or TEST.	LINE 1.
Receive line 2 on an external reperforator. Cut tape locally using the keyboard transmitter and the perforator while the page printer mechanism monitors the copy.	SEND		KEYBD & TAPE.	KEYBD	TEST[b]	LINE 1.
Send to and receive from line 2 on the transmitter-distributor and an external reperforator while sending to the page printer and line 1 from the keyboard transmitter. Tape copy of line 1 message will be produced.	SEND	START[a]	KEYBD & TAPE.	KEYBD	LINE 1	LINE 1.

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.
[b] Follow the instructions given in paragraph 36c to set up the automatic line return.

j. Patch Panel Condition J. The following chart describes the required switch settings for patch panel condition J. Local perforation of tape is possible if an external reperforator is plugged into the MONITOR 2 jack at the rear of the perforator.

Patch Panel Condition J

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to and receive from line 1 with the transmitter-distributor and the page printing mechanism.	SEND	START[a]	KEYBD	REPERF	LINE 1	LINE 1.
Send to and receive from line 2 with the keyboard transmitter and the perforator.	SEND		KEYBD	REPERF	LINE 1 or TEST.	LINE 1.
Send from the transmitter-distributor to the page printer to check tape prior to transmission. Automatic line return on line 1.	SEND	START[a]	KEYBD	REPERF	TEST[b]	LINE 1.
Local perforation of tape using an external reperforator to receive from line 2.	SEND		TAPE	KEYBD	LINE 1 or TEST.	LINE 1.

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 36*c* to set up the automatic line return.

k. Patch Panel Condition K. Messages from the line may be received by the page printer mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition K.

Patch Panel Condition K

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from keyboard transmitter to line 1.	SEND		KEYBD			
Receive line 4 on perforator				REPERF		
Send from transmitter-distributor to line 2.		START[a]				

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

l. Patch Panel Condition L. Messages from the line may be received by the page printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition L.

Patch Panel Condition L

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send from transmitter-distributor to line 1.		START [a]				
Send from keyboard transmitter to line 2.	SEND		KEYBD			
Receive line 3 on perforator				REPERF		

[a] A preliminary setting to **FEED RETRACT** position is required to allow for tape position.

m. Patch Panel Condition M. Messages from the line may be received by the page printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition M.

Patch Panel Condition M

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch Line switch key	ALR MONITOR switch
Send from transmitter-distributor to line 1 or line 2.	LOCK	START [a]	KEYBD	REPERF	LINE 1 or LINE 2.	
Receive line 4 on perforator				REPERF	LINE 1 or LINE 2.	
Send from keyboard transmitter to line 1 or line 2.	SEND	STOP	KEYBD	REPERF	LINE 1 or LINE 2.	

[a] A preliminary setting to **FEED RETRACT** position is required to allow for tape insertion.

n. Patch Panel Condition N. The following chart describes the required switch settings for patch panel condition N.

Patch Panel Condition N

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to and receive from line 1 with the keyboard transmitter and the page printing mechanism.	SEND		KEYBD	REPERF		
Send from transmitter-distributor to line 2.	SEND	START [a]	KEYBD	REPERF		
Receive line 3 on perforator				REPERF		

[a] A preliminary setting to **FEED RETRACT** position is required to allow for tape insertion.

o. Patch Panel Condition O. Messages may be received from the line at all times by the page printer without special switch settings. The following chart describes the required switch settings for patch panel condition O.

Patch Panel Condition O

Operation desired	SEND-LOCK switch	Transmitter-distributor STOP-START lever	Keyboard control switch	Perforator control switch	Line switch key	ALR MONITOR switch
Send to and receive from line 1 with the transmitter-distributor and the perforator.		START [a]		REPERF		
Send from keyboard transmitter to line 2.	SEND		KEYBD			

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

35. Performance Test

Adjust the switches for the patch panel condition of the unit and send test messages from the keyboard transmitter and transmitter-distributor and receive test messages into the page printing mechanism. Check the following:

a. End-of-line indicator lamp should light at the typing of the 66th character on a line. The margin signal bell should ring when the 66th character is printed. The carriage should return automatically after the 72d character is passed. Carriage return should take place when the carriage return code impulse is received.

b. Observe the action of the page printer ribbon feed mechanism while printing. The inking ribbon must be lifted and fed each time a character is typed.

c. Check the space bar, FIGS key, and LTRS key to see that they function properly.

d. With the platen in the figures (raised) position, press the LTRS button on the page printer dust cover. The platen should move to the letters position.

e. When the carriage is toward the center of the platen, press the CAR. RET. button on the dust cover. The carriage should return to the left margin.

f. Check the tape printed and punched by the perforator. The message should be correctly and cleanly printed and punched.

g. Check the perforator ribbon feed mechanism. The ribbon should feed every other time a character is printed.

h. Operate the manual tape feed-out lever on the perforator when the perforator control switch is in the REPERF position. The tape should feed out when the lever is operated.

i. Press the back space lever. The tape should back up one space with each depression of the lever.

j. Insert cut tape into the transmitter-distributor. Make sure that the copy sent is correct.

k. Make the following tests while the transmitter-distributor is sending. Each of these actions should stop transmission.

(1) Raise the tight-tape lever.
(2) Move the STOP-START lever to the STOP or FEED RETRACT position.
(3) Pass the end of the message tape under the tape cover, over the tape-out lever.

36. Setting Tabulator

The tabulator mechanism is used to align a message in columnar form quickly and easily. The tabulator is also helpful when frequent indentation is required. Set and use the tabulator as follows:

a. Press down on the tab crank arm at the left of the tabulator, and with a pencil or other suitable instrument, pull down the desired tab set levers. The red tab set levers indicate those spaces which are multiples of five.

b. Pull up the tabulator locking lever at the right of the tabulator stop lever. The tabulator locking lever controls the operation of the tabulator. When it is in the up position, the tabulator will operate; when it is in the down position, the tabulator will not operate.

c. To cause the tabulator to stop at the predetermined spaces, press the space bar and hold down on the repeat key. When the carriage reaches the preset tab set lever, transmission from the keyboard transmitter will stop.

d. Releasing the REPEAT key allows transmission to resume. Type in the desired information and press the space bar and the REPEAT key to cause the carriage to move to and stop at the next preset tab set lever.

e. If the tabulator stop is to be skipped, press the space bar and the REPEAT key to cause the carriage to move to the next preset tab set lever.

37. Correcting Errors in Tape

When punching tape on the perforator for transmission at a later time, incorrect code groups that are punched into the tape can be corrected as follows:

a. Depress the back space lever of the perforator until the incorrect code group in the tape is over the punching mechanism in the code die assembly.

b. Depress the LTRS key. This will cancel out the incorrect code combination perforated into the tape.

c. Type the correct letter or symbol and then continue typing the remainder of the message.

d. If the error is not noticed until several characters are punched, use the LTRS key to cancel out all code groups typed after the error occurred. Starting with the incorrect code group, type in all the code groups that were canceled and continue with the message.

38. Automatic Line Return

The automatic line return feature permits the Teletypewriter Set AN/FGC–25 to be used for local operation without disturbing the signal line. All of the components of the set which are normally used on the signal line in conjunction with the page printer may be fully utilized for local purposes. In the event that the distant station begins to transmit message traffic, the automatic line return will immediately return the page printer to the signal line and leave all other components in the local operational status. After the message is completed, the page printer may be returned to local operational use by simply moving the line switching key to the line position involved and then back to the TEST position. If one of the components which is normally used with the page printer on the signal line is required to be used on the signal line, the line switching key must be manually positioned for the desired line. The following sequence must be followed when initially setting up the automatic line return.

a. Place the line switch key in either LINE 1 or LINE 2, whichever line is to be monitored.

b. Place the AIR MONITOR switch to either LINE 1 or LINE 2, whichever line is to be monitored.

c. Return the line switch key to the TEST position.

39. Stopping Procedure

a. During operation, a teleprinter operator at any sending station can stop the motors of all other page printers equipped with the motor stop feature in the circuit by transmitting the figures code group, placing all machines in the figures position, and then transmitting the STOP code group. The motors of all page printers in the circuit will be stopped and will remain in standby condition. The motors may be started when in this condition by briefly placing the LINE-BREAK switch of any page printer in the circuit in the BREAK position, momentarily opening the signal circuit.

b. Stop the teleprinter and close it to traffic as follows:

(1) Place the page printer MOTOR switch in the OFF position.
(2) Place the page printer LIGHT switch in the OFF position.
(3) Place the perforator MOTOR switch in the OFF position.

40. Emergency Procedure

If any of the components of the set become disabled, the operator personnel should proceed as follows:

a. Notify the maintenance unit at the station. Describe as fully as possible the nature of the trouble encountered.

b. Notify the other stations in the circuit connected to the component that is in trouble and estimate, if possible, the length of time required before operation can be resumed.

CHAPTER 4
THEORY

Section I. THEORY OF TELETYPEWRITER SET AN/FGC–25 (*)

41. General

This chapter contains a complete explanation of the theory of operation of Teletypewriter Set AN/FGC–25(*). The first section covers the overall fundamentals of teletypewriter communication and the means by which this set operates in circuits with other teletypewriters, as well as the interfunctioning of the components of the set. Paragraphs 45 through 81 describe the function of the page printer, paragraphs 82 through 109 deal with the perforator, paragraphs 110 through 121 explain in detail the electrical circuits of the teletypewriter set.

42. Basic Teletypewriter System

Figure 49 shows a basic circuit for operating two interconnected teletypewriter sets on a neutral basis. Impulses sent from either sending contact operate the selector magnets in both teletypewriters. In neutral operation, the selector magnets are operated when the current flows and are released when no current flows, in accordance with the signal code group that determines the character to be transmitted or received. In a basic circuit such as this, each station has a means of sending and a means of reception. Additional stations, sending units, or receiving units can be added to this basic circuit as required.

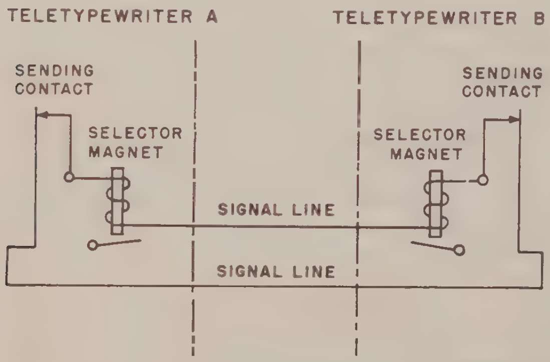

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Figure 49. Basic circuit for operating interconnected teletypewriters.

43. Set Component Relationship

a. Teletypewriter Set AN/FGC–25(*) includes two sending units (keyboard transmitter and transmitter-distributor) and two receiving units (page printing mechanism and perforator). When connected with another Teletypewriter Set AN/FGC–25(*) in a half duplex circuit (fig. 50), the sending mechanisms controlled by the keyboard transmitters or the transmitter-distributors operate sending contacts to transmit electrical start-stop, 5-unit signal codes. The selector magnets at the receiving units respond to these signals to position the selector mechanisms which in turn control the characters printed by the page printing mechanisms and punched and printed by the perforators.

b. The mechanisms of these sets are driven by constant speed motors operated in synchronism so that code signals sent at a given speed will be received at the same speed at the receiving unit. However, there are always small variations in speed between independent motors; therefore interoperating units will get out of step unless these differences are compensated. This is accomplished by clutch action which causes the mechanism of the receiving units to start at the beginning of each code group and to stop at the end of each code group. Starting the two mechanisms together at the beginning of each code group prevents accumulation of small speed variations of the motors from affecting the code sequence.

44. Standard Start-Stop, Five-Unit Code

a. Signal intelligence is transferred between teletypewriters through the use of a standard start-stop, 5-unit code. The code group for each of the 26 letters of the alphabet and each of the

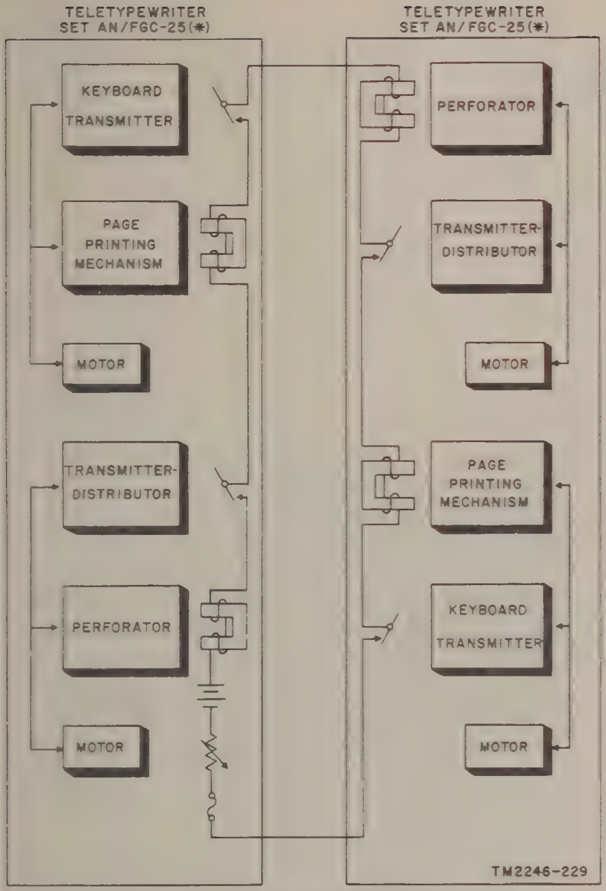


Figure 50. Interconnected Teletypewriter Sets AN/FGC-25(*), block diagram.

functional operations requires seven individual impulses to be sent. Two of these impulses never vary. The first (start) impulse and the last (stop) impulse are standard impulses which are used to keep the receiving equipments in synchronism. The 5 impulses which may be varied provide 32 code combinations. These code combinations have been assigned to individual letters and functions as shown in figure 51.

b. When the function keys of the keyboard transmitter are depressed, the following occurs in the page printing mechanism:

Key	Action
BLANK	Nothing printed.
CAR. RET	Carriage moves to left of unit.
LINE FEED	Paper moves up either a single line space or double line space depending upon the position of the single double line feed lever.
LTRS	Platen shifts to the letters position.
STOP	When the platen is in the figures position, the motor stops and the page printer is placed in standby condition.
BELL	Signal bell rings when the platen is in the figures position.
FIGS	Platen shifts to the figures position.

c. When the function keys are depressed, the perforator punches the code group in the tape and prints the following symbols on the tape:

Key	Symbol
BLANK	Blank symbol (fig. 51).
CAR. RET	Carriage return symbol (fig. 51).
LINE FEED	Line feed symbol (fig. 51).
LTRS	Nothing printed.
STOP	Nothing printed.
BELL	Bell symbol (fig. 51).
FIGS	Nothing printed.

Section II. MECHANICAL THEORY OF PAGE PRINTER

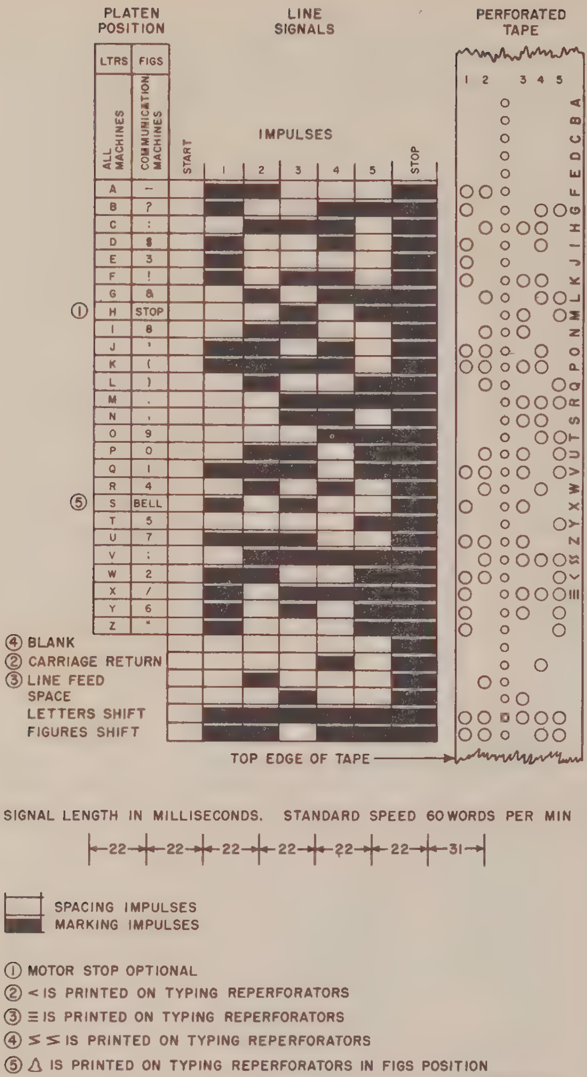
45. General

a. Teletypewriters TT–117/FG and TT–119/FG consist of a sending unit (keyboard transmitter) and a receiving unit (page printing mechanism). The sending and receiving units are mounted on a common base. Each unit is electrically capable of operating independently, if that type of operation is desired.

b. The keyboard transmitter is capable of transmitting either standard sequential 5-unit, start-stop code to the signal line or simultaneous code groups through a 11-wire circuit to the multi-solenoid magnet of the perforator. The page printing mechanism can receive only standard start-stop, 5-unit code.

46. Sequential Signaling Code

a. The signaling code used in teletypewriter communication is not the same as the Morse code of manual telegraphy. In Morse code operation, the code for different characters consists of varying numbers of units or elements that have unequal lengths (dots and dashes). In standard teletypewriter operation, the code for different characters always consists of five units or elements of equal length. These equal-length units are


PLATEN POSITION
LINE SIGNALS
PERFORATED TAPE
1 2 3 4 5
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ≶ < ≡
TOP EDGE OF TAPE
SIGNAL LENGTH IN MILLISECONDS. STANDARD SPEED 60 WORDS PER MIN
22 22 22 22 22 22 31
TM2246-205

PLATEN POSITION LTRS ALL MACHINES	FIGS COMMUNICATION MACHINES	START	1	2	3	4	5	STOP
A	–	□	■	■	□	□	□	■
B	?	□	■	□	□	■	■	■
C	:	□	□	■	■	■	□	■
D	$	□	■	□	□	■	□	■
E	3	□	■	□	□	□	□	■
F	!	□	■	□	■	■	□	■
G	&	□	□	■	□	■	■	■
① H	STOP	□	□	□	■	□	■	■
I	8	□	□	■	■	□	□	■
J	'	□	■	■	□	■	□	■
K	(	□	■	■	■	■	□	■
L	)	□	□	■	□	□	■	■
M	.	□	□	□	■	■	■	■
N	,	□	□	□	■	■	□	■
O	9	□	□	□	□	■	■	■
P	0	□	□	■	■	□	■	■
Q	1	□	■	■	■	□	■	■
R	4	□	□	■	□	■	□	■
⑤ S	BELL	□	■	□	■	□	□	■
T	5	□	□	□	□	□	■	■
U	7	□	■	■	■	□	□	■
V	;	□	□	■	■	■	■	■
W	2	□	■	■	□	□	■	■
X	/	□	■	□	■	■	■	■
Y	6	□	■	□	■	□	■	■
Z	"	□	■	□	□	□	■	■
④ BLANK		□	□	□	□	□	□	■
② CARRIAGE RETURN		□	□	□	□	■	□	■
③ LINE FEED		□	□	■	□	□	□	■
SPACE		□	□	□	■	□	□	■
LETTERS SHIFT		□	■	■	■	■	■	■
FIGURES SHIFT		□	■	■	□	■	■	■

□ SPACING IMPULSES
■ MARKING IMPULSES

① MOTOR STOP OPTIONAL
② < IS PRINTED ON TYPING REPERFORATORS
③ ≡ IS PRINTED ON TYPING REPERFORATORS
④ ≶ IS PRINTED ON TYPING REPERFORATORS
⑤ Δ IS PRINTED ON TYPING REPERFORATORS IN FIGS POSITION

Figure 51. Standard start-stop, 5-unit code chart.

called marking and spacing impulses. Figure 52 shows the 5-unit code group for the letter X. Codes for other characters are made by combining the five elements in different combinations. By using all the possible combinations available yields 32 different 5-unit groups; therefore, it is possible to transmit 32 different code groups in the standard start-stop code.

b. Standard start-stop signals are transmitted by neutral or polar operation. In neutral operation, current flows through the circuits in one direction only. Marking impulses are current impulses, and spacing impulses are no-current impulses. In polar operation, current flows through the circuit in both directions. Marking impulses are current impulses in one direction, spacing impulses are current impulses in the opposite direction, that is, of opposite polarity.

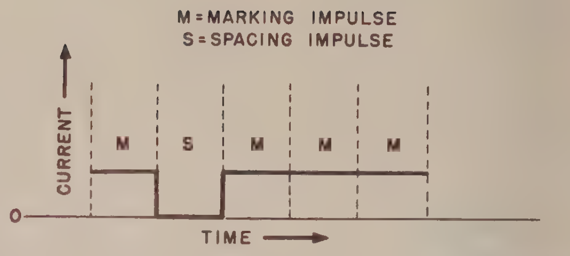


Figure 52. Five-unit, start-stop code group for the letter X.

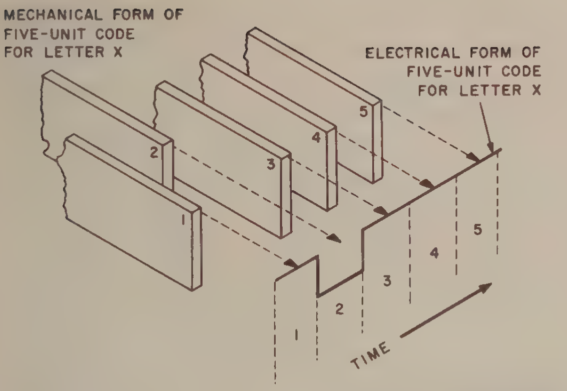
c. The page printing mechanism and the perforator can receive both neutral and polar impulses. The keyboard transmitter and the transmitter-distributor in these sets are wired to send neutral impulses. Polar signals can be transmitted if the transmitters are rewired.

47. Basic Principle of Sequential Operation

a. The basic principle of sequential teletypewriter transmission is the transformation of a mechanical or position relationship into an electrical and time relationship. The basic principle of teletypewriter reception is the transformation of an electrical and time relationship into a mechanical relationship. At the sending teleprinter, the mechanical relationship is set up by pressing a key lever, which positions five code bars on the keyboard transmitter, or the positioning of five code sensing levers on the transmitter-distributor. At the receiving end, a corresponding code ring must be operated to position it in the proper mark or space position.

b. The time sequence of code impulses is formed when the five impulses that represent a character are transmitted in succession. The electrical form of this 5-unit code is composed of five elements of marking or spacing impulses. In the keyboard transmitter, the mechanical form of the code is composed of five code bars, which are positioned to the right for marking and to the left for spacing. These code bars, aided by other linkages and a power drive, convert the mechanical form of the code into transmitted electrical form (fig. 53).

c. The first code bar of the sending teleprinter controls the transmission of the first code impulse, the second code bar controls the transmis-


MECHANICAL FORM OF FIVE-UNIT CODE FOR LETTER X
ELECTRICAL FORM OF FIVE-UNIT CODE FOR LETTER X
1
2
3
4
5
1
2
3
4
5
TIME

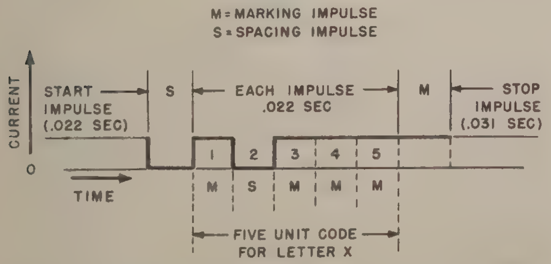
TM 2246-153

Figure 53. Relationship between mechanical (position) and electrical (time) forms of 5-unit code.

sion of the second code impulse, and so on for the five code impulses.

48. Synchronism

Starting and stopping the receiving mechanism in synchronism with the sending mechanism is accomplished by transmitting two additional impulses along with the 5-unit code impulses for each character. The start impulse is a spacing impulse sent immediately preceding the 5-unit code impulses (fig. 54). The stop impulse is a marking impulse sent immediately following the 5-unit code impulses. The start impulse causes the receiving mechanism to start operating when the sending mechanism starts. The stop impulse causes the receiving mechanism to stop as the sending mechanism stops. Thus, even if the receiving mechanism is not synchronized with the sending mechanism, it will be brought to a complete stop before the next signal is sent to be ready to start in step again. The length of the start impulse is equal to that of one of the other five impulses, and the stop impulse is 1.42 times as long. The receiving shaft speed is greater than the transmitter shaft speed, thus, the receiving mechanism has enough time to complete its function.



TM 2246-155

Figure 54. Standard start-stop 5-unit code signal for the letter X, plus start and stop impulses.

49. Motors

Transmitting and receiving mechanisms of the teleprinter are driven by electric motors located at the right-hand sides of the units. Teletypewriter Set AN/FGC–25 is powered by synchronous motors and Teletypewriter Set AN/FGC–25–X by series-governed motors.

a. Synchronous Motors (B, fig. 146). The synchronous motor used in Teletypewriter TT–117/FG is used with single phase, 115 volt ac at a frequency of 60 cycles. This type motor is rated at 1/20 horsepower, at 3,600 rpm, and uses a squirrel cage type motor armature. Its stator has a main running winding and an auxiliary starting winding. The starting winding is in series with capacitors C9A and C9B, resistor C9C, and the contacts of motor start relay E3. The initial starting current causes relay E3 to close its contacts and shift the phase in the starting winding circuit to provide the initial torque necessary to start armature rotation. As the motor armature gains speed, the current that flows through the motor (and also the relay coil) decreases. When a predetermined current value is reached, the relay deenergizes and its contacts open, and the starting winding circuit remains completed through a single capacitor (C9B). The motor armature continues to accelerate until it reaches 3,600 rpm. The motor is wired so that the motor armature rotates clockwise when viewed from the blower wheel end. The motor armature shaft (fig. 209) has a taper pin and a tapped hole for fastening the worm gear. End play is taken up by a conical spring, which bears against one of the ball bearings. The motor front and rear castings are fastened to the frame by four machine screws and lockwashers.

b. Series-Governed Motor (A, fig. 146). The series-governed motor used in Teletypewriter TT–119/FG operates on 105- to 125-volt regulated or unregulated ac and is governed to run at 3,600 rpm. The armature and field coils are in series with the contacts of the motor governor assembly, the contacts of motor-stop relay E1, MOTOR switch S5, and overload protection fuse F1. The governor contacts normally are closed, but they are open when the motor speed increases above the allowable maximum. This places resistor R1 in series with the motor and causes the current and thus the speed of the motor to decrease. When the proper speed is reached, the governor contacts close again. Resistor R1, in combination with capacitor C1, also acts as a spark suppressor for the governor contacts. Motor filter Z1 suppresses radio frequencies generated by the governor contacts and the motor commutator. The suppression of these frequencies minimizes interference with associate electronic equipment. The contacts of motor-stop relay E1 are opened to stop the motor when the upper case H code group is transmitted. The contacts remain in the open position until the line current is broken (by the operation of LINE BREAK switch S3) at any teleprinter in the circuit; the contacts close when the line circuit is closed again by releasing LINE BREAK switch S3. MOTOR switch S5 is in the ON position during all periods of operation and is placed in the OFF position only when the equipment is shut down completely.

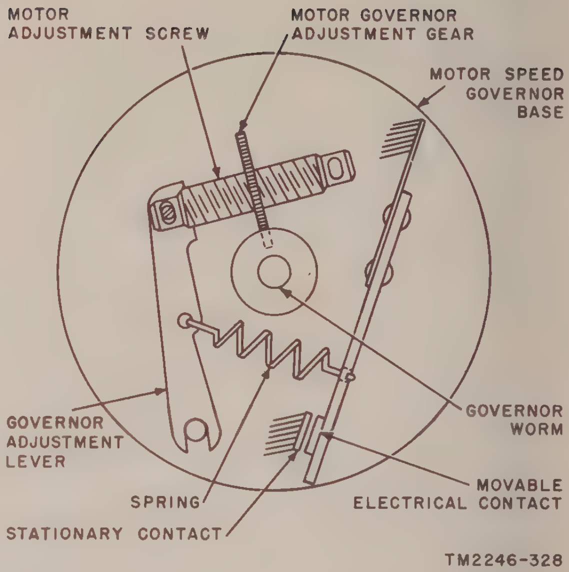

MOTOR ADJUSTMENT SCREW
MOTOR GOVERNOR ADJUSTMENT GEAR
MOTOR SPEED GOVERNOR BASE
GOVERNOR WORM
MOVABLE ELECTRICAL CONTACT
GOVERNOR ADJUSTMENT LEVER
SPRING
STATIONARY CONTACT
TM2246-328

Figure 55. Governor, series-governed motor, functional view.

50. Governor

a. The motor governor assembly on the series-governed motors is adjustable to permit the motor speed to be maintained at precisely 3,600 rpm. The governor is mounted on the motor armature shaft and rotates with it. The governor contact points are connected in series with the field coils and motor armature through two slip rings (located on the back of the motor governor assembly) which are contacted by two electrical contact brushes in the motor housing. The movable electrical contact of the governor assembly (fig. 55) is flexible and is held against the stationary electrical contact by a spring until the motor speed exceeds 3,600 rpm. When this occurs, the centrifugal force acting on the movable electrical contact is greater than the tension of the spring. The movable electrical contact then moves away from the stationary electrical contact. The speed at which this will occur depends on the tension applied to the spring by a governor adjustment lever, which should be adjusted while the motor is running by manipulating the governor worm.

b. The governor worm has two integral threaded portions, one right hand and one left hand. Complete instructions for adjusting the motor speed of the series-governed motors are given in paragraph 22. A tuning fork is used with target spots (white dots) on the governor assembly. If

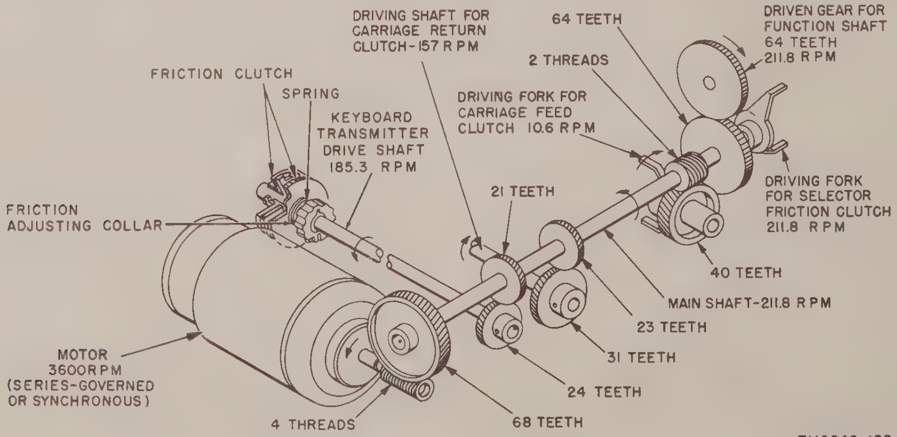

DRIVING SHAFT FOR CARRIAGE RETURN CLUTCH-157 R P M
64 TEETH
DRIVEN GEAR FOR FUNCTION SHAFT 64 TEETH 211.8 R P M
FRICTION CLUTCH
SPRING
2 THREADS
KEYBOARD TRANSMITTER DRIVE SHAFT 185.3 R P M
DRIVING FORK FOR CARRIAGE FEED CLUTCH 10.6 R P M
DRIVING FORK FOR SELECTOR FRICTION CLUTCH 211.8 R P M
FRICTION ADJUSTING COLLAR
21 TEETH
40 TEETH
MAIN SHAFT-211.8 R P M
23 TEETH
31 TEETH
MOTOR 3600 R P M (SERIES-GOVERNED OR SYNCHRONOUS)
24 TEETH
4 THREADS
68 TEETH
TM2246-128

Figure 56. Mechanical power distributing in the page printer with standard 368.1 opm drive gear set in use.

adjustment is necessary, the end of the governor worm is pulled outward while the motor is running. The worm is held in this position until the clockwise motion (motor speed too fast) of the target has practically stopped. If the target spot appears to be moving counterclockwise (motor speed too slow), the end of the governor worm is pushed inward until the apparent counterclockwise motion of the target has practically stopped. To avoid overadjustment, the worm is released slightly before the spot comes to a complete standstill.

51. Main Shaft and Power Distribution

The mechanisms of the page printer are driven through gears on the main shaft that are rotated by the motor. These gears turn the plate and disk of the friction clutch for the keyboard transmitter shaft, as well as the driving forks of friction clutches for the selector camshaft, the carriage-feed shaft, the driving shaft of a positive clutch for the carriage-return mechanism, and the driving gear for the function shaft. The speeds of rotation shown for the various parts are those that occur at standard 368.1 opm. When other drive gear sets are used, the speeds of the shafts are proportionately higher although the motor speed remains constant.

52. Keyboard Transmitter

Power for the keyboard transmitter camshaft is received through a friction clutch on the keyboard drive shaft and makes rapid start and stop actions possible. A typical friction clutch is shown in figure 57. The fork on the driven shaft engages the notches on the center clutch disk of the clutch. Two felt friction plates on the driving shaft are held against the center clutch disk by spring pressure. The spring pressure can be increased or decreased by tightening or loosening the clutch collar. The friction between the center clutch disk and the friction plates on the driving shaft is sufficient to rotate the driven shaft through its driving fork when it is carrying its normal workload. If the cam-stop lever is in a position to block the transmitter camshaft, the friction between the center clutch disk and the friction plates is overcome. The center disk is stopped and remains stationary between the two felt friction washers. When the cam-stop lever is mechanically moved out of the path of the transmitter camshaft, the camshaft resumes rotation for the next code group.

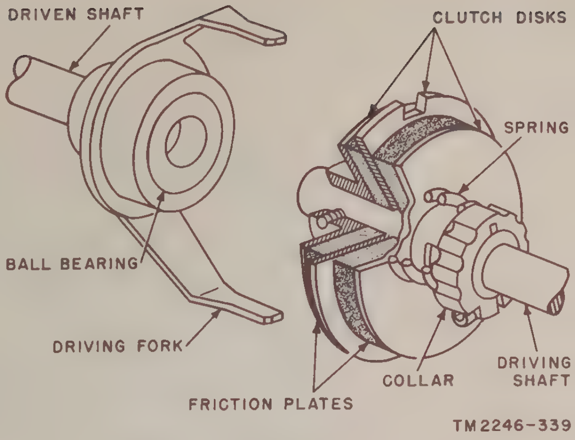


Figure 57. Typical friction clutch.

53. Keyboard Transmitter Operation

a. The keyboard sequential transmitter mechanism (fig. 58) consists of key levers, code bars, and sensing levers that are used in selecting the code group to be transmitted, a XMTR camshaft, selector levers, and transmitting contacts E4 for transmitting the selected code group; a universal bar, cam-stop lever, and a friction clutch that are used in starting and stopping transmission.

b. The clutch yoke is mounted on the keyboard XMTR camshaft. The friction clutch and transmitter shaft driven gear are mounted on the keyboard-transmitter drive shaft (fig. 56). The transmitter shaft driven gear (24 teeth) derives its force from the transmitter shaft drive gear (21 teeth) on the main shaft of the page printer. The XMTR camshaft is held stationary when the cam-stop lever is held up by a locking lever latch.

54. Transmitting Mechanism, Transforming 5-unit Code from Mechanical to Electrical Form

a. The five code bars used to set up the mechanical form of the code are located under the key levers (fig. 59) and run the width of the keyboard transmitter so that they can be engaged by depressing any key lever. Each code bar is notched in one of two ways at the points where it is engaged by each key lever. The sides of these notches are slated to the right or to the left so that the downward movement of a key lever pushes the code bars either to the right or left. The notches are cut so that the first code bar will move to the right (fig. 60) if the first unit of the code for the key depressed is a marking signal. If the second unit of the code is to be a spacing signal, the movement

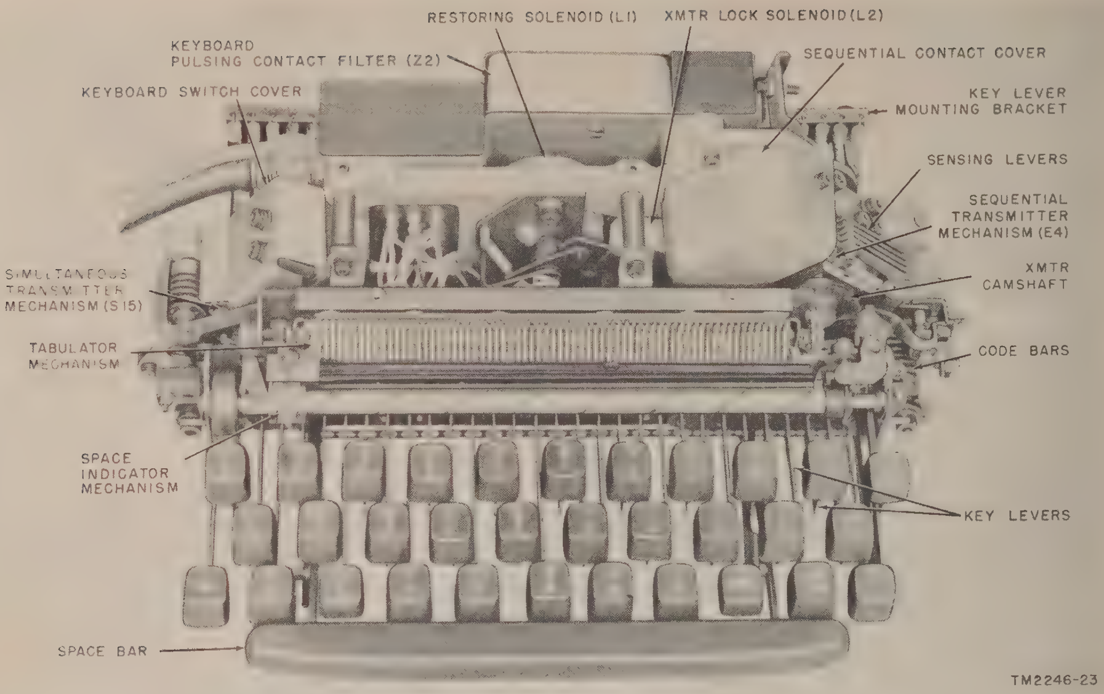


Figure 58. Keyboard transmitter parts

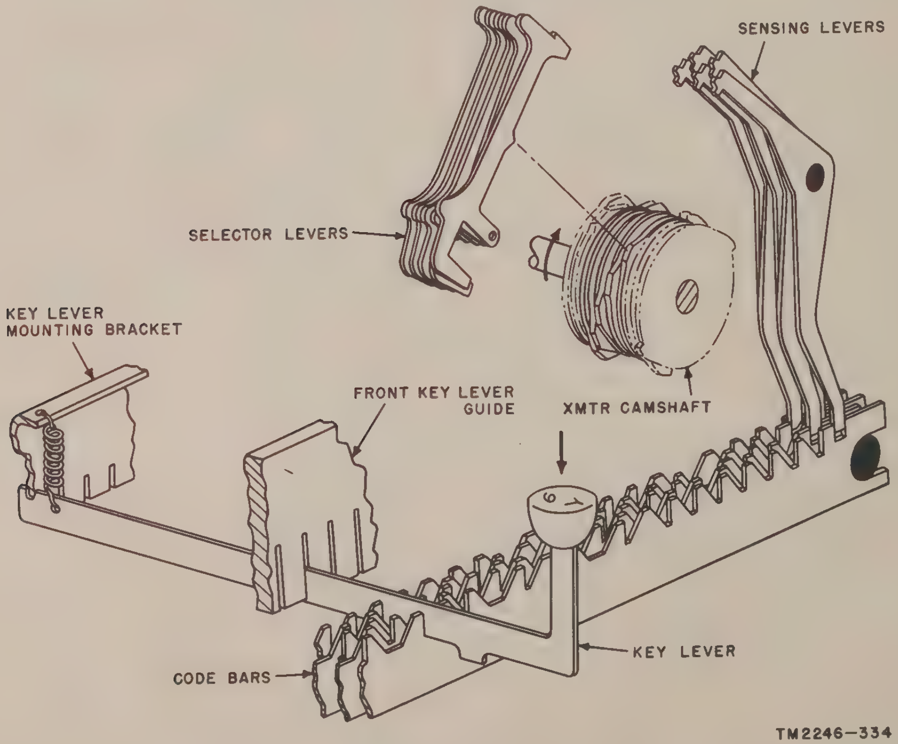
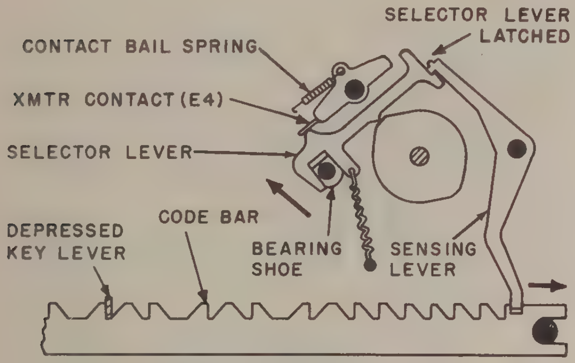


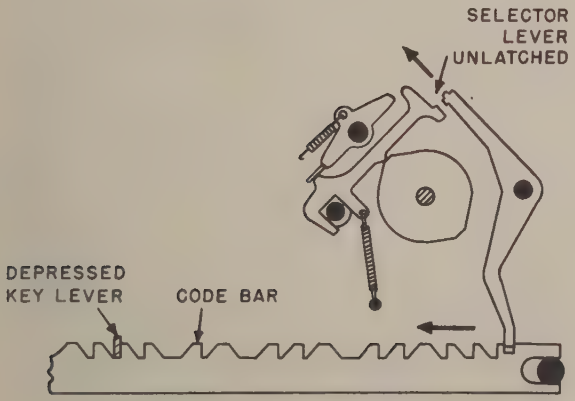
Figure 59. Setting up mechanical form of code by operating key lever.

of the second code bar will be to the left (fig. 60).

b. Transforming the positions of the code bars into a sequence of electrical signals is accomplished by controlling the position of XMTR contact E4 by the code bars and five rotating cams on the XMTR camshaft, five selector levers, and five sensing levers (fig. 60). Each code bar moves only its associated sensing lever. Any selector lever, however, will actuate XMTR contact E4 when the selector lever is moved by its associated cam. The five cams are angularly displayed so that they operate their associated selector levers and XMTR contact E4 in sequence as the XMTR camshaft rotates. Marking and spacing signals are sent as follows: A code bar shifted to the right turns its mating sensing lever counterclockwise so that the end of the sensing lever engages the end of the selector lever. When the lobe of the mating cam raises the midpoint of the selector lever, its lower end slides on the bearing shoe and closes XMTR contact E4, because its upper end is latched by the sensing lever. Conversely, a code bar shifted to the left turns its mating sensing lever clockwise so that the end of the sensing lever does not latch the end of the selector lever. When the lobe of the mating cam raises the midpoint of the selector lever, its upper end moves and permits the contact bail spring to open XMTR contact E4.



A. SENDING MARKING IMPULSE



B. SENDING SPACING IMPULSE

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Figure 60. Operation of transmitting, transforming mechanical settings into electrical impulses.

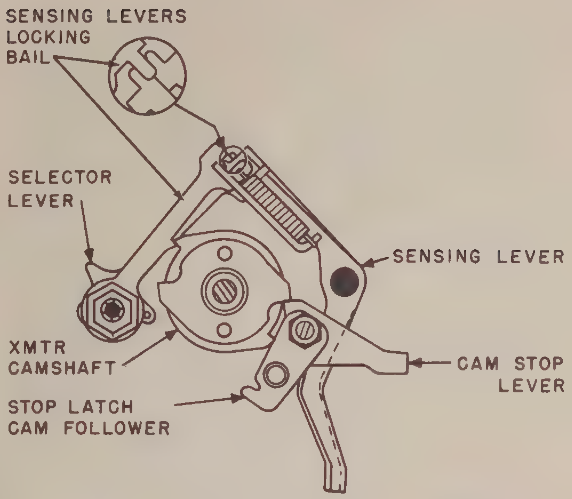

Figure 61. Sensing levers locked by locking bail.

c. As soon as a key lever is depressed, the sensing levers (fig. 61) are locked in position until the code group is completed so that depressing another key lever right away will not interfere with the settings. This locking is accomplished by the engagement of the sensing lever locking bail with the upper ends of the sensing levers when the sensing lever locking bail drops.

55. Starting and Stopping XMTR Camshaft

a. The XMTR camshaft starts to turn automatically when a key lever is depressed and comes to a halt after a code group is transmitted. This rapid start and stop action is made possible by using a friction clutch to drive the XMTR camshaft. When the key levers are not operated, the XMTR camshaft is held in the stopped position by the cam stop lever (fig. 62), which engages the stop tooth on the XMTR camshaft. The cam-stop lever drops to release the XMTR camshaft when the locking lever latch is turned by moving the universal bar to the right. The universal bar is mounted between the tabulator bar and the first of the five signal code bars and is moved with them, but always to the right, whenever any key lever is depressed.

b. To stop the XMTR camshaft after a code group is transmitted, the cam-stop lever is raised by the action of restoring solenoid L1 (fig. 62). When restoring solenoid L1 is energized, its shaft turns counterclockwise and turns the link arm assembly that moves the actuating link. The actuating link turns the stop latch cam which actuates the stop latch cam follower. The stop latch cam follower pivots the cam-stop lever to restore it to the stopping position. The cam-stop lever then is held in this restored position by the repeat blocking lever so that the stop tooth on the XMTR camshaft again engages the cam-stop lever. When the lower end of the cam-stop lever drops, the repeat blocking lever, attached to the locking lever latch by a spring, is caught in back of the cam-stop lever. This occurs because the repeat blocking lever extends a few thousandths of an inch higher than the locking lever latch. When the cam-stop lever is raised by the action of restoring solenoid L1, the repeat blocking lever is pulled under it by the spring. This holds the cam-stop lever in position to catch the tooth on the XMTR camshaft and stop the XMTR camshaft from rotating. After the key lever is released, the spring on the locking lever latch pulls it back, and the universal bar is pushed to the left. If the key lever is released earlier, that is, before the cam-stop lever is restored, the cam-stop lever becomes latched directly by the locking lever latch.

c. The restoring solenoid L1 is energized by the keyboard counter switch S12 on the back side of the keyboard transmitter casting. The keyboard counter cam follower (fig. 63), mounted on the keyboard filter mounting bracket, rides against the keyboard counter cam on the clutch yoke. When a key lever is depressed and the cam-stop lever moves out of the way to allow the XMTR camshaft to rotate, the keyboard counter cam follower is on the low part of the keyboard counter cam. When the clutch yoke rotates a short way, keyboard counter cam follower pivots to close keyboard counter switch S12, which energizes the restoring solenoid L1. Thus, the cam-stop lever is placed in position to stop the XMTR camshaft well before the first half revolution is completed.

d. The following chart lists the sending operation sequences for sequential signals whenever a

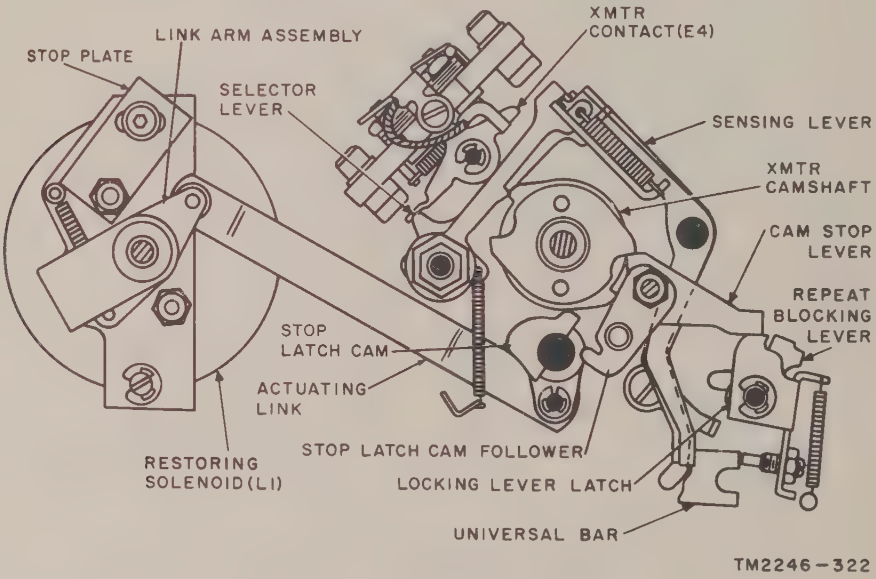

Figure 62. Cam-stop lever mechanism.

key lever (other than the repeat key lever) is struck:

Sequence Chart for Sending Sequential Signals

1	Key lever or space bar depressed.	
2	Universal bar shifted to right.	Five code bars moved individually to right or left according to code.
3	Locking lever latch turned.	Five sensing levers turned individually counterclockwise or clockwise.
4	Cam-stop lever dropped between locking lever latch and repeat blocking lever.	
5	XMTR camshaft starts revolving.	Five sensing levers locked by sensing lever locking bail (key lever may be released at any time hereafter).
6	Contact bail spring turns XMTR contact E4 counterclockwise.	
7	Start impulse sent.	
8	First 5-unit code impulse raises No. 1 selector lever.	
9	If latched by sensing lever, lower end of selector lever No. 1 turns XMTR contact E4 clockwise; if not latched by sensing lever, contact bail spring turns XMTR contact E4 counterclockwise.	
10	Mark or space impulse sent, depending upon whether XMTR contact E4 is turned clockwise or counterclockwise.	
11	Keyboard counter cam follower pivoted by the keyboard counter cam action to close keyboard counter switch S12 and energize restoring solenoid L1.	
12	Restoring solenoid L1 pivots stop latch cam raising cam-stop lever in position to engage tooth on XMTR camshaft.	
13	Cam-stop lever latched up in position by repeat blocking lever if universal bar is still shifted, or locking lever latch if universal bar has been released by key lever.	
14	Second, third, fourth, and fifth code impulses sent by corresponding parts of transmitter mechanism as for first code impulse.	
15	Cam-stop lever raises No. 6 selector lever (permanently latched).	
16	Lower end of No. 6 selector lever turns XMTR contact E4 clockwise.	
17	Stop impulse sent.	
18	Tooth on XMTR camshaft strikes cam-stop lever and XMTR camshaft stops revolving (having completed ½ revolution).	
19	Key must be released before above sequence can be repeated for any other or for the same key lever to allow the locking lever latch to return under the cam-stop lever.	

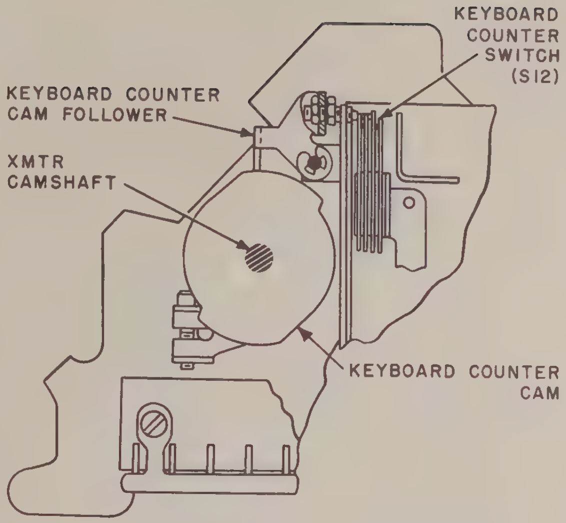

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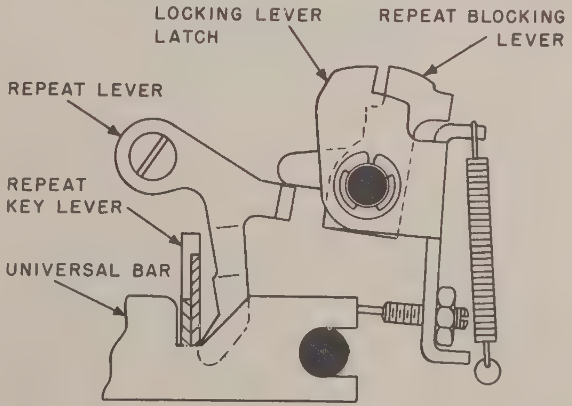
Figure 63. Keyboard counter switch S12 mechanism.

56. Character Repeat Feature

a. General. The teleprinter is equipped with a REPEAT key which, when depressed, permits the last character (or space) previously sent to be repeated as long as both keys are depressed. This feature is made possible by the REPEAT key lever and the repeat lever (fig. 64). When the REPEAT key lever is depressed, it strikes the universal bar, moving it to the right and causing the locking lever latch to move out from under the cam-stop lever. At the same time, the REPEAT key lever turns the repeat lever, which prevents movement of the repeat blocking lever and prevents the cam-stop lever from being latched. Therefore, the cam-stop lever, though raised by restoring solenoid L1, drops again and does not stop the XMTR camshaft so that the selected code groups are repeated with each one-



TM2246-324

Figure 64. Repeat mechanism.

half revolution as long as both key levers are depressed.

b. Sequence Chart for Sending Sequential Repeat Signals. The following chart lists the sequence of operations when the repeat key is depressed.

Sequence Chart for Sending Sequential Repeat Signals

1 Repeat key and code designation key depressed.
2 Same sequence of operations takes place as indicated in the chart in paragraph 55*d* up to a point where cam-stop lever is latched by the repeat blocking lever.

Note. REPEAT key is either released or still depressed at this point. Rest of sequence is identical with previous chart if released. If REPEAT key is still held, sequence given below takes place.

3 Repeat lever holds repeat blocking lever away from locking lever latch.
4 Cam-stop lever remains in space between repeat blocking lever and locking lever.
5 Stop cam raises No. 6 selector lever (permanently latched).
6 Lower end of No. 6 selector lever turns XMTR contact clockwise.
7 Stop impulse sent.
8 Tooth on XMTR camshaft passes cam stop lever.
9 XMTR camshaft continues to turn and above sequence is repeated.

57. Basic Principle of Simultaneous Sending Operation

a. The teleprinter set uses the same general form of 5-unit teletypewriter code for simultaneous operation that it uses for sequential operation, except that time is not a factor in the simultaneous operation. Changing the mechanical setting to an electrical setting is accomplished by closing the electrical contacts to one circuit for a marking impulse and to a different circuit for a spacing impulse, with two circuits provided for each of the five code impulses (fig. 65). To accommodate the two circuits for each of the five code impulses, a 11-wire connection is required between the simultaneous sending unit and the simultaneous receiving unit. After the marking or spacing circuits for the five units of the code are closed, the circuits energize the receiving multisolenoid.

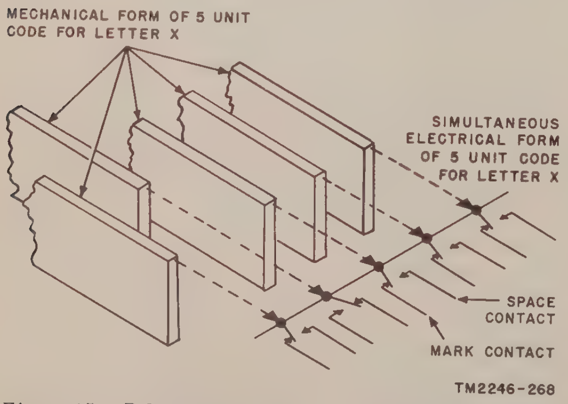

MECHANICAL FORM OF 5 UNIT CODE FOR LETTER X
SIMULTANEOUS ELECTRICAL FORM OF 5 UNIT CODE FOR LETTER X
SPACE CONTACT
MARK CONTACT
TM2246-268

Figure 65. Relationship between the mechanical and electrical forms of the 5-unit code in a simultaneous circuit.

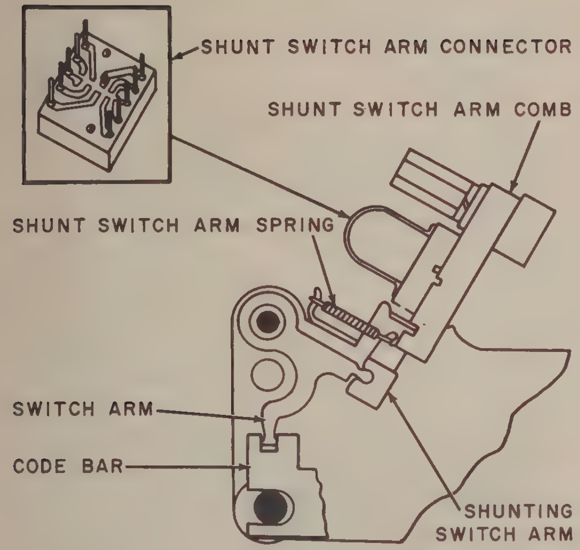
b. Simultaneous signals originated in the simultaneous transmitter mechanism (fig. 58) of the keyboard transmitter are received only by the receiving multisolenoid of the perforator. Consequently, this means of sending is used only when perforating tape for messages originating at the keyboard transmitter.

58. Setting Up Mechanical Form of Simultaneous Code

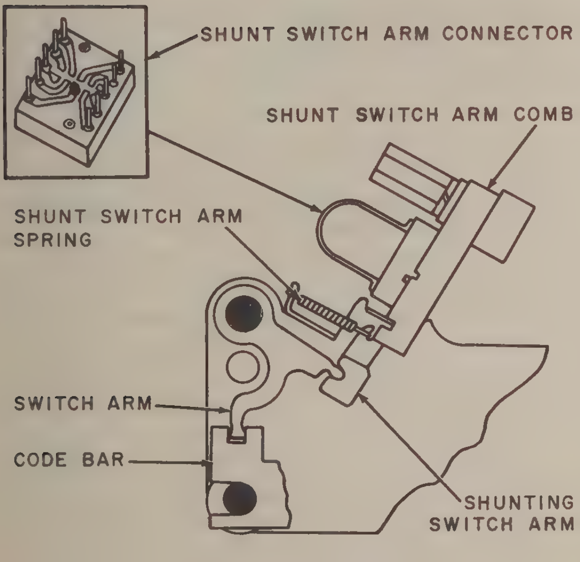
a. Setting up the mechanical form of the simultaneous code is similar to setting up the sequential code form. The sequential operation takes place on the right side of the keyboard transmitter and the simultaneous operation occurs at the left of the keyboard transmitter (fig. 58). The same code bars that set up the sequential sending unit set up the simultaneous unit. The sequential signal is sent to the signal line and the simultaneous signal is sent to the perforator.

b. When a key lever is depressed, each code bar is shifted either to the left or to the right, depending on whether a marking or a spacing impulse is being set up (fig. 59). The movement of the code bar pivots its corresponding switch arm (fig. 66) at the left side of the keyboard transmitter. If the code group requires the first impulse to be a marking impulse, the first code bar is shifted to the right, pivoting the first switch arm to the right. Likewise, if the second impulse is to be a spacing impulse, the second code bar is shifted to the left, pivoting the second switch arm to the left. The other three switch arms are positioned the same way.

c. The switch arms operate similar to a bell crank. When the lower projection of the switch arm is moved to the right (A, fig. 66), the other extension moves in an upward direction. When the lower projection of the switch arm moves to the left (B, fig. 66), the other extension moves in a downward direction. This up and down motion is transferred to a shunting switch arm which forms part of the simultaneous circuit. The shunting switch arm makes contact at one of two positions, upper or lower, on the shunt switch arm connector. In the marking position, the shunting



A. MARKING POSITION



B. SPACING POSITION

Figure 66. Setting up mechanical form of 5-unit code for simultaneous transmission.

switch arm makes contact with an upper circuit on the shunt arm switch connector. In the spacing position, the shunting switch arm makes contact with a lower circuit on the shunt arm switch connector. Thus one circuit of simultaneous transmitter mechanism S15 is closed for marking impulses and one circuit is closed for spacing impulses for each of the five units of the code. The eleventh circuit is a common or return circuit.

59. Pulsing Simultaneous Circuits

a. After the circuits have been set up (par. 58), all the circuits of the simultaneous transmitter mechanism are energized and send impulses through the 11-wire circuit to the perforator receiving multisolenoid. This is accomplished by the keyboard reader switch S11 (fig. 67) mounted on the right rear of the keyboard.

b. Each time a code group is set up by depressing a key lever, the universal bar moves the locking lever latch, which causes the cam-stop lever to pivot clockwise out of the way of the XMTR camshaft (par. 55). The cam-stop lever is mounted on a shaft which pivots with the lever. On the reverse side of this shaft and on the rear of the keyboard transmitter casting, a switch actuating lever is mounted. When the switch actuating lever pivots, it operates a switch arm that closes the keyboard reader switch S11 to energize the simultaneous circuit. As restoring solenoid L1 is energized to restore the cam-stop lever, the switch actuating lever pivots the switch arm to open the keyboard reader switch S11 and the circuit.

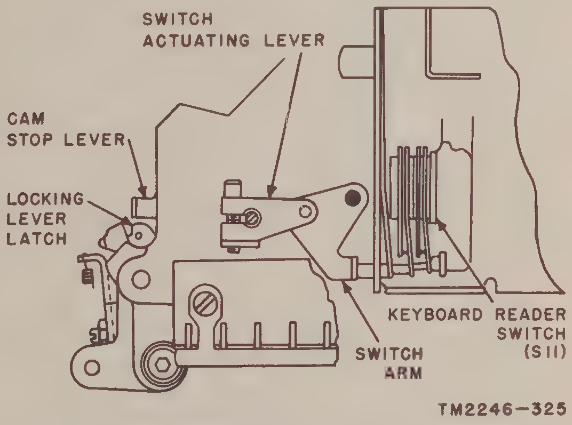


Figure 67. Closing keyboard reader switch S11 to energize simultaneous circuit.

c. When tape is being cut on the perforator from simultaneous signals originating at the keyboard transmitter, and the keyboard transmitter is not sending to the signal line at the same time, the XMTR camshaft performs no function; consequently there is no need for it to rotate. XMTR lock solenoid L2 is used to prevent the rotation of the XMTR camshaft at this time (fig. 68). XMTR lock solenoid L2 is energized all the time keyboard control switch S23 on the perforator is in the TAPE position. When XMTR lock solenoid L2 is energized, its shaft turns counterclockwise, rotating the cam arm with it. The cam arm pivots the lockup lever, moving it in the way of the XMTR lockup plate on the clutch yoke. Since the XMTR camshaft does not rotate, the pulsing of the restoring solenoid L1 (fig. 62) by the action of the keyboard counter cam follower (fig. 63) does not occur. This is accomplished instead by receiving multisolenoid pulsing contacts S18 (fig. 121) of the perforator.

d. Because the XMTR camshaft does not revolve, transmission of simultaneous impulses can be done with a free keyboard; that is, there is no time lag necessary between key lever depressions to allow for the half revolution of the camshaft to be completed. Thus, the operating speed and rhythm is controlled by the perforator camshafts rather than by the locking and unlocking of the XMTR camshaft.

e. Following is a sequence chart for sending simultaneous signals from the keyboard transmitter.

Sequence Chart for Sending Simultaneous Signals

1	Key lever depressed.	
2	Universal bar shifted to right.	Five code bars shifted individually to right or to left to accommodate code.
3	Locking lever latch turned.	Five switch arms turned individually counterclockwise or clockwise.
4	Cam-stop lever drops between locking lever latch and repeat blocking lever.	Shunting switch arm moves to close either upper or lower circuit on shunt switch arm connector.
5	Switch actuating lever on the other end of the cam-stop lever shaft pivots, pivoting the switch arm.	
6	Switch arm closes keyboard reader switch S11 energizing the simultaneous circuits.	
7	Simultaneous circuits close circuits to the perforators.	
8	Receiving multisolenoid pulsing contacts S18 on perforator energize restoring solenoid L1.	
9	Restoring solenoid L1 pivots stop latch cam.	
10	Stop latch cam moves cam-stop lever counterclockwise, latching it with the repeat blocking lever if the key lever has not been released, or with the locking lever latch if key lever has been released. This allows the universal bar to shift to the left.	
11	Switch actuating lever on other end of cam-stop lever pivots clockwise, pivoting the switch arm.	
12	Switch arm allows keyboard reader switch S11 to open, deenergizing the simultaneous circuit.	

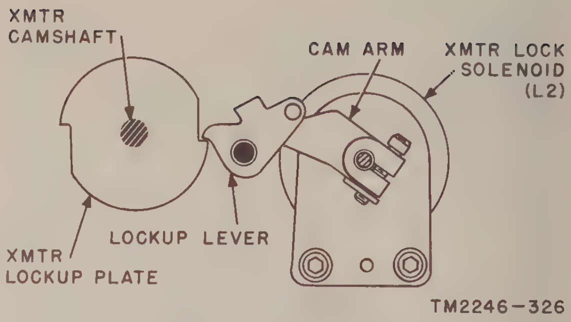


Figure 68. Locking of XMTR camshaft to prevent rotation during simultaneous operation.

60. Receiving Sequential Code Impulses

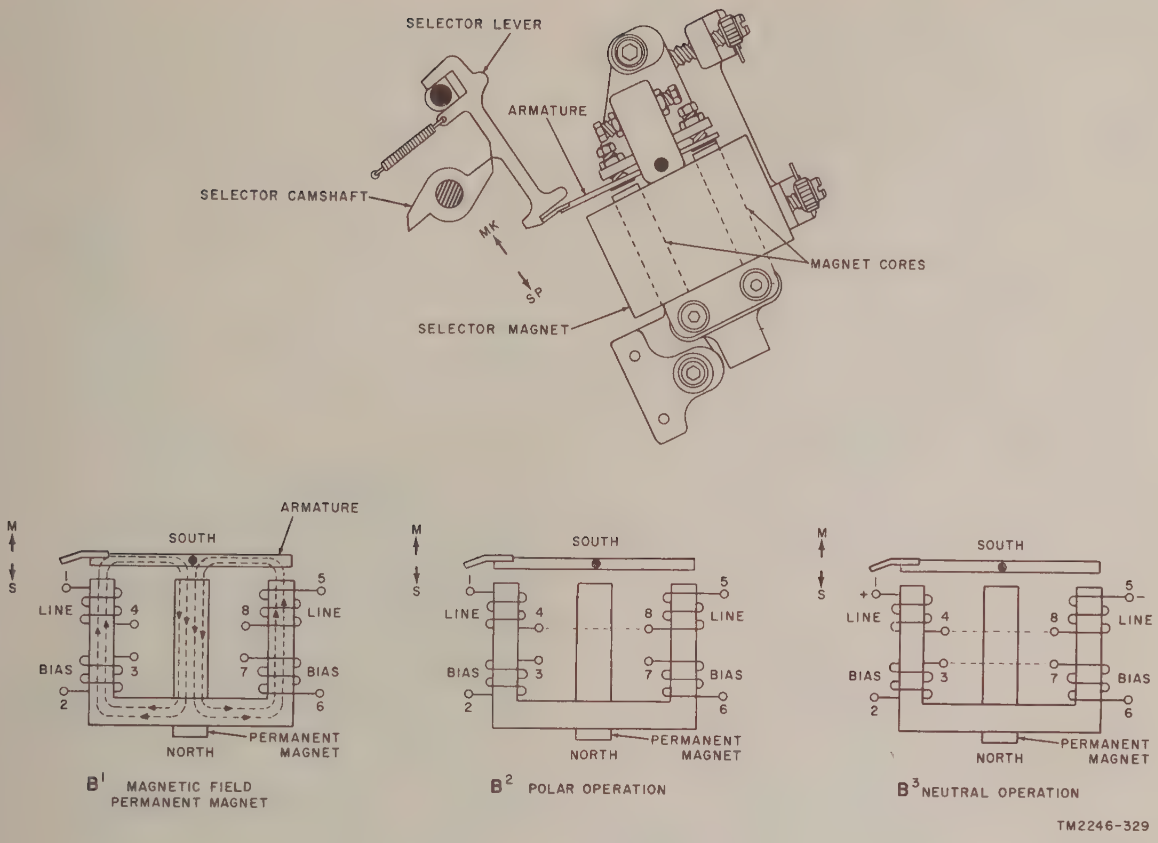
a. Polar Selector Magnet Operation.

(1) A polar selector magnet (fig. 69) consists of a permanent bar magnet, an armature, a potentiometer, and two line and two bias windings mounted on a U-shaped silicon steel core. Around each arm of the U-shaped core are wound one line and one bias winding. A detailed description of the circuits of the magnet is given in paragraph 112*b* and *c*.

(2) The armature (fig. 69) is pivoted at its center and is magnetically balanced over the open end of the core. The permanent magnet sets up a magnetic field that is concentrated around the core. When a winding around the core is energized, the magnetic field that is set up by the energized circuit unbalances the permanent magnet field and causes the armature to move on the central pivot. Currents through the windings increase the magnetic field pull on one end of the armature, while decreasing the permanent magnet field pull on the opposite end. This makes the armature sensitive to slight current flows in the windings.

(3) When operating in polar circuits, the bias windings are not used. The line windings are connected in parallel for 30-ma operation (B2, fig. 69).

(*a*) During a marking impulse, current flows through the line windings. Terminals 1 and 8 are positive and terminals 4 and 5 are negative. The magnetic field set up by the line winding around the left arm *opposes* the field of the permanent magnet, and little pull is present on the left side of the armature.



B^1 MAGNETIC FIELD PERMANENT MAGNET

B^2 POLAR OPERATION

B^3 NEUTRAL OPERATION

Figure 69. Polar selector magnet.

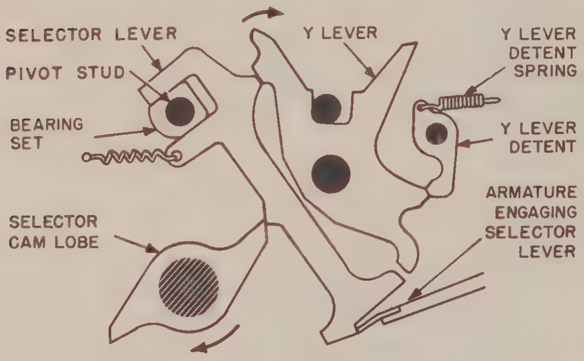
The magnetic field set up by the line winding around the right arm of the core is poled to *aid* the field of the permanent magnet; therefore, the right end of the armature is pulled toward the right arm of the U-shaped core. The left end of the armature, which includes the armature blade, moves to the marking position away from the left arm of the core and into the path of the selector levers.

(*b*) During reception of a polar spacing impulse, current flow in the line windings is reversed, and the opposite of the above occurs. The magnetic pull on the right end of the armature is *weakened* and the pull on the left is *increased*, causing the armature to be drawn toward the left arm of the core.

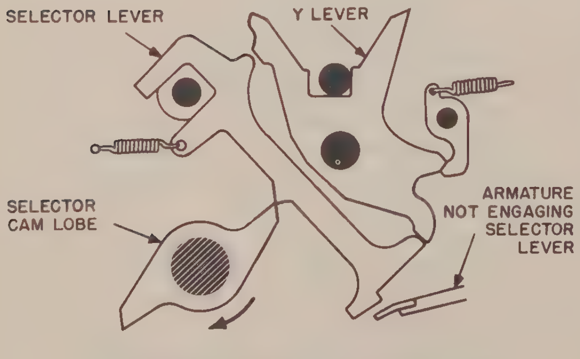
(4) When operating in neutral circuits, the bias windings must be used. They are wired in series and are energized constantly. The magnetic field set up by the left bias winding is poled to *aid* the magnetic field of the permanent magnet. The field of the right bias winding *opposes* the field of the permanent magnet. During reception of a neutral spacing impulse, current is not present in the line windings. The combined magnetic fields of the energized bias windings and the permanent magnet cause the blade end of the armature to be pulled toward the left core, away from the selector levers. Current flows in both line windings during reception of a neutral marking impulse. The current value in a line winding normally is twice the bias current value. The field set up by the energized line winding around the left core *opposes* the combined magnetic fields of the left bias winding and the permanent magnet. The energized line winding around the right core *aids* the field of the permanent magnet and *opposes* the field of the right bias winding.

Therefore, a marking impulse in the line windings will cause the right end of the armature to be pulled toward the right core arm, and the left (blade) end is moved into the path of the selector levers (marking position). Neutral operation of this selector magnet is possible in both 20- and 60-ma circuits. The line windings are connected in series for 20-ma neutral operation, and in parallel for 60-ma neutral operation. Adjustment of the bias current value to obtain optimum machine range is accomplished with a potentiometer which is connected in series in the bias circuit.

b. Transformation of Electrical Impulses Into Mechanical Settings. Figures 70 and 71 show the parts of the selector mechanism of the page printing mechanism that perform the operations of transforming electrical code impulses into mechanical settings. Primarily, they consist of recording the movements made by the selector magnet armature in accordance with the code impulses received. The windings of the magnet cause the armature to move to one of two positions, depending on whether the impulse received is a marking or a spacing impulse (*a* above). This position is then recorded by the subsequent positioning of the selector mechanism of the page printing mechanism.



A. RECORDING MARKING IMPULSE



B. RECORDING SPACING IMPULSE

Figure 70. Impulse recording portion of the selector mechanism.

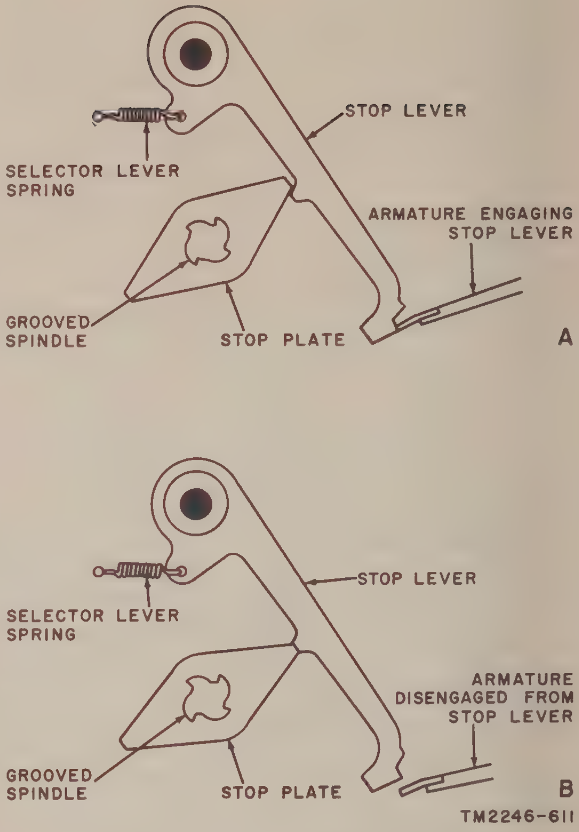


Figure 71. Selector camshaft and stop plate.

c. Selecting Operation.

(1) Each of the five electrical impulses that comprise the code for a character is recorded in the form of a clockwise or counterclockwise movement of five corresponding Y-levers. This is accomplished through the use of five selector cam lobes operating in conjunction with five selector levers and the armature. The five Y-levers are mounted on a common Y-lever pivot stud, the five selector levers are mounted on the selector lever pivot stud, and the five selector cam

lobes are mounted on a shaft with the cam lobes projecting at angles from the camshaft. One selector cam lobe operates in conjunction with only one selector lever and one Y-lever. Thus, there are five planes, one in back of the other, each containing one of these three parts. The end of the selector magnet armature, however, is broad enough to engage all five selector levers. Each of these five sets of parts records one of the impulses of the 5-unit code. The first set records one of the impulses of the 5-unit code. The first set records the first impulse, the second set the second impulse, etc.

(2) During the time a marking impulse is received (A, fig. 70), the selector magnet armature is moved in the path of a selector lever. Near the middle of this time period, the selector cam lobe corresponding to the impulse being received (the first cam lobe for the first impulse or the second cam lobe for the second impulse, etc.) will rotate to the position shown and raise the selector lever. As the armature prevents movement of the lower end of the selector lever, it is forced to move at its upper end by sliding on the bearing set. In doing so, the selector lever pushes against the Y-lever, turning it clockwise (unless it is already in that position). Further rotation of the selector camshaft permits the selector lever to drop back, but the Y-lever is held in the clockwise position by the Y-lever detent. A marking impulse thus is recorded in the form of the clockwise position of a Y-lever.

(3) During the time a spacing impulse is received (B, fig. 70), the selector magnet armature is moved away from the selector levers. Near the middle of this time period, the selector cam lobe corresponding to the impulse being received will rotate to the position shown and raise the selector lever. The end of the armature now does not prevent movement of the lower end of the selector lever; therefore it is free to move. In moving, the selector lever pushes against the lower portion of the Y-lever, turning it counterclockwise (unless it is already in that position). A spacing impulse thus is recorded in the form of the counterclockwise position of a Y-lever. The Y-lever detent holds the Y-lever in the space position.

(4) Each 5-unit code impulse, in turn, thus is recorded in the form of a clockwise (marking) or a counterclockwise (spacing) setting of five corresponding Y-levers.

d. Synchronization.

(1) To synchronize the cam lobes with the incoming electrical impulses, the cam lobes are set into motion from a stopped position at the start of each code group and stopped at the end of each code group. The selector camshaft is driven from the end of the main shaft by a friction clutch similar to that of the keyboard transmitter. Normally when no messages are being received, current flows in the windings of the selector magnet, and the camshaft is prevented from turning by the interoperation of the selector magnet armature, stop lever, and stop plate (fig. 71). When raised, the armature engages the stop lever (mounted on the selector lever pivot stud) which in turn prevents the stop plate and selector camshaft from turning. When the start (no-current) impulse for a code group is received, the armature disengages the stop lever, releasing the stop lever and stop plate (B, fig. 71). The selector camshaft (fig. 69), driven by the friction clutch, immediately starts to turn, bringing the first selector cam lobe (fig. 70) into engagement with its selector lever by the time the next impulse (first 5-unit impulse) is received.

(2) Thereafter, each of the remaining five selector cam lobes engages its corresponding selector lever, one after the other, because of the angular displacement of the cam lobes with respect to each other. The speed with which the selector camshaft rotates is such that each of the five cam lobes hits its respective selector lever when the corresponding electrical impulse is being received. All five cam lobes operate their selector levers within one-half revolution of the selector camshaft. The selector camshaft is limited to making only one-half revolution per code group because, after the last

5-unit impulse is received, the stop impulse raises the selector magnet armature to engage the stop lever. The other end of the stop plate which then comes around is held by the stop lever to stop the camshaft.

e. Summary. The operations described in *a* through *d* above are summarized in the sequence chart below.

Receiving Sequence Chart A

1 Start impulse received.
2 Selector magnet armature moves away from stop lever.
3 Stop lever released.
4 Stop plate released.
5 Selector camshaft starts revolving.
6 First 5-unit code impulse pulls armature up or armature remains disengaged, depending on whether impulse is marking or spacing.
7 No. 1 selector cam lobe lifts No. 1 selector lever.
8 No. 1 selector lever pivots about end of armature if armature is up (marking), or about selector lever pivot stud if armature is down (spacing).
9 No. 1 selector lever pushes No. 1 Y-lever clockwise if selector lever is pivoting about armature (marking) or counterclockwise if selector lever is pivoting about pivot stud (spacing).
10 Second, third, fourth, and fifth code impulses in turn operate the corresponding parts of the selector mechanism, as described above for the first impulse, so that each Y-lever is set clockwise or counterclockwise for its corresponding mark of space impulse.
11 Latch-tripping cam turns transfer lever latch.

Note. The action described in Receiving Sequence Chart B, Paragraph 61*h*, begins at this point in the sequence of operations.

12 Stop impulse received.
13 Armature moves in path of stop lever.
14 Stop lever latched by armature.
15 Stop plate engages stop lever.
16 Stop plate held by stop lever.
17 Selector camshaft stopped at end of ½ revolution.

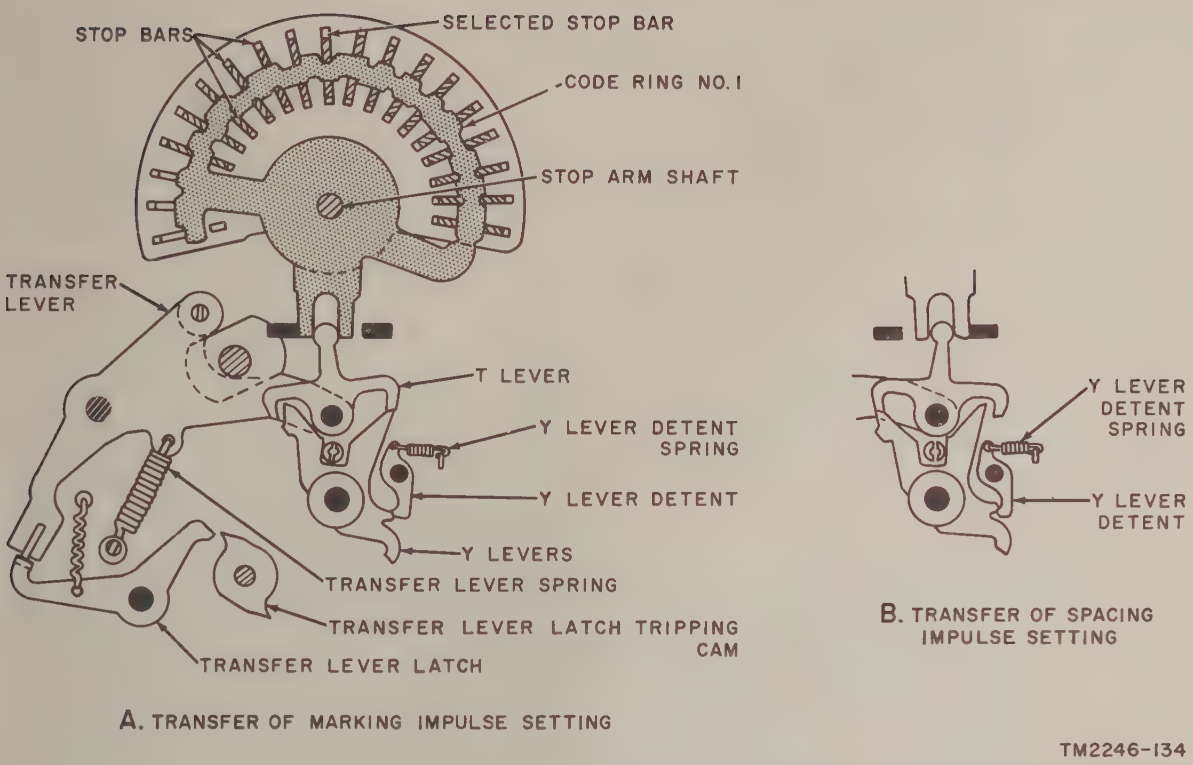
61. Transfer Operation

The five code rings of the typing unit must be positioned according to the incoming code group to select the character which is to be printed. The incoming code group is stored in the five Y-levers in clockwise and counterclockwise settings. The Y-lever settings are transferred to the code rings, positioning them.

a. The selector code rings (fig. 72) are positioned about the stop arm shaft for clockwise or counterclockwise movement. Each code ring has a slotted tail that mates with a corresponding one of a set of five inverted T-levers. These T-levers are mounted on a common pivot stud on the end of the transfer lever. Turning a T-lever causes the mating code ring to turn. The T-levers are mounted in the same planes as their corresponding Y-levers, and the ends of the T-levers can be engaged with the ends of the Y-levers by turning the transfer lever. The prongs of the T-levers are farther apart than those of the Y-levers; therefore, only one end of each lever will engage at any time. When the transfer operation takes place, the transfer lever turns and moves all the T-levers against the Y-levers; this action transfers the five settings of the Y-levers to the corresponding code rings. Each Y-lever set clockwise (for a marking signal) is engaged by its T-lever on the right side; this causes the mating code ring to be placed in the clockwise position. Each Y-lever set counterclockwise (for a spacing signal) is engaged by its T-lever on the left side; this causes the mating code ring to be placed in the counterclockwise position.

b. The transfer operation, or turning of the transfer lever, takes place after the fifth code impulse is stored in the Y-levers but before the selector camshaft is brought to rest by the stop impulse. A sixth or latch tripping cam mounted on the selector camshaft (fig. 72) trips the transfer lever latch and the transfer lever is pulled down by the transfer lever spring. The timing of the latch tripping cam with respect to the five selector cams and the stop plate is such that the tripping action takes place only after the selecting operation is completed and before the selector camshaft is arrested.

c. After the five code impulses have operated the corresponding parts of the selector mechanism and the transfer operation takes place, the five code rings are locked in position by a code ring locking bail (fig. 73). A locking bail cam on the function shaft drives a cam follower after the transfer operation takes place. The code ring cam follower locking lever engages the code ring locking bail through a code ring locking lever on the code ring locking bail shaft. The code ring locking bail engages each code ring either on one or the other side of a small projection, depending on the position (clockwise or counterclockwise) of the code ring, to prevent the code ring from moving in either direction. They are effectively locked until the function camshaft has almost completed its one-half revolution. At this time, the cam follower raises the code ring locking bail and the code rings are now free to receive the next code group. Each code ring has notches cut into



A. TRANSFER OF MARKING IMPULSE SETTING

B. TRANSFER OF SPACING IMPULSE SETTING

Figure 72. Transfer mechanism operation.

its inner and outer edges to correspond with 35 crossing stop bars. Three of these stop bars are duplicate function stop bars and are used for the functions carriage return, figures and line feed.

d. The notches in the first code ring are arranged so that when the code ring is set in the clockwise (marking position) there will be a low point opposite the stop bars for the code groups that have a marking impulse (such as A, B, and D) as the first code impulse; there will be a high point opposite the stop bars for those code groups that have a spacing impulse (such as C, G, and H) as the first code impulse. The reverse is true when the code ring is set in the counterclockwise (spacing) position. The second code ring is notched in accordance with the second impulse for each code group, the third code ring for the third code impulse, etc. Therefore, when the code rings have been set as a result of the transfer operation, there will be only one position (except in the case of the carriage return, figures and line feed functions for which duplicate stop bars are provided) along the inner or outer radius of the code rings where there will be a notch in each of the five rings under a stop bar. Figure 74 shows the characters and functions assigned to each stop bar in the code ring cage.

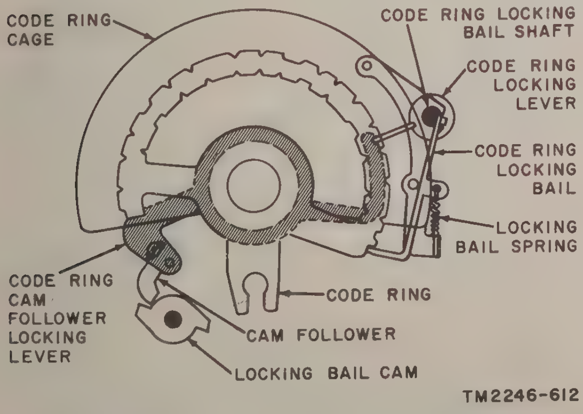


Figure 73. Code ring locking mechanism.

e. The pressure of the stop bar spring pushes this stop bar into the notches (fig. 75) to arrest the rotation of the stop arm shaft. The stop bar, previously pushed into an aligned set of notches, is pushed out by the sloping surface at the side of a notch in at least one code ring ring when the code rings are reset by the transfer operation (unless the same stop bar is selected by repeating a code group). This action releases the stop

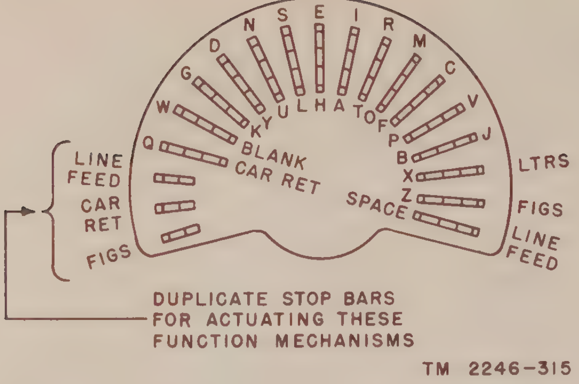


Figure 74. Characters and functions operated by stop bars.

arm shaft so that it turns until it strikes a newly selected stop bar.

f. Because the stop arm shaft must be positioned accurately to select the proper characters and functions, little bouncing can be tolerated when the square shaft stop arm is arrested by a stop bar. To prevent excessive bouncing, an antibounce clutch (fig. 76) is installed on the stop arm shaft. The inner portion of the antibounce clutch is integral with the stop arm shaft. The square shaft stop arm is fixed to the front end, and the other end is rigidly coupled to the square shaft. The four rollers of the antibounce clutch are spring loaded in a tangential direction. Because of this, only clockwise rotation of the stop arm shaft can take place. The rollers roll along the inside surface of the cylindrical housing. Any attempt to make the stop arm shaft rotate counterclockwise immediately causes the rollers to jam between the housing and the moving part of the antibounce clutch. Thus, any tendency to reverse direction is minimized.

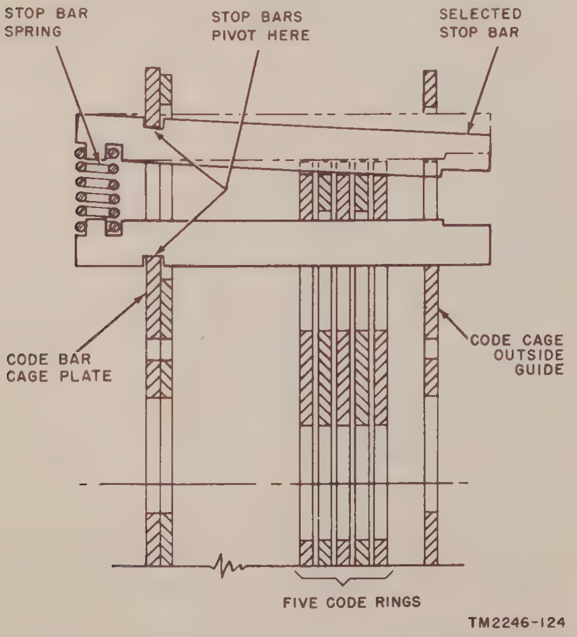


Figure 75. Code ring cage; stop bar pushed into alined code ring notches.

g. The 35 stop bars are arranged in two semicircular rows on the code ring cage. The ends of the stop bars in the outer row move radially inward when selected and the ends of the stop bars in the inner row move radially outward when selected. The square shaft stop arm has one inner and one outer projection (on each end) for engaging the corresponding rows of stop bars. These projections are separated angularly by a space equal to one and one-half times the space between the stop bars, so that inner stop bars arrest the arm at positions halfway between outer stop bar positions. Thus, there are 32 different stop positions available. The three duplicate stop bars, known as function stop bars, are assigned to carriage return, figures, and line feed functions. These function stop bars do not project from the code ring cage into the path of the square shaft stop arm.

h. The operations described in *a* through *g* above are summarized in the following sequence chart.

Receiving Sequence Chart B

1 Transfer lever latch tripping cam turns transfer lever latch.

2 Transfer lever latch releases transfer lever.

Note. The action described in Receiving Sequence Chart C below (function shaft operation) begins at this point in the sequence of operations.

3 Transfer lever moves five T-levers down.

4 T-levers transfer settings of Y-levers to code rings.

5 Code rings repositioned unless previous signal was repeated.

6	Previously selected stop bar pushed out (cam action, unless previous signal was repeated).	Stop bar pushed into aligned notches in code rings.

7 Stop arm released (free to turn to next stop position, unless previous signal was repeated).

Note. The action described in Receiving Sequence Chart D (printing operation) begins at this point in the sequence of operations.

62. Function Shaft Operation

Figure 77 shows the mechanism that provides the intermittent drive which rotates the square shaft stop arm and type selecting arm to the next selected position, actuates the printing and other functional operations, and raises the transfer lever so that the next code group can be received. It consists primarily of the function shaft which is power-driven intermittently one-half revolution every time a complete code group is received. The function shaft starts to revolve automatically as soon as the transfer operation takes place.

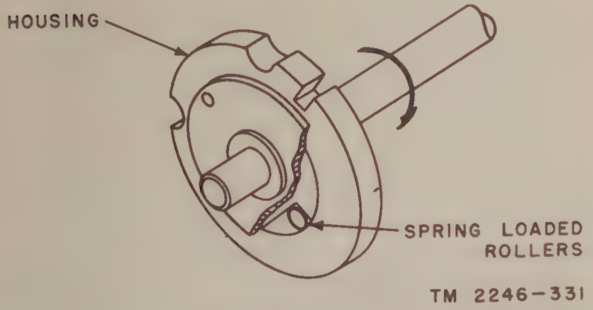


Figure 76. Antibounce clutch for stop arm.

a. The function shaft driven gear runs free on the function shaft and is driven continuously by its mating function shaft driving gear on the main shaft. The driven gear has clutch teeth on its face, which can be engaged by the function shaft sliding clutch drum to couple the function shaft to the function driven gear. The function shaft sliding clutch drum is keyed to the function shaft by the mating flexible-coupling disk so that the function shaft and function shaft sliding clutch drums must turn together, and is spring loaded for

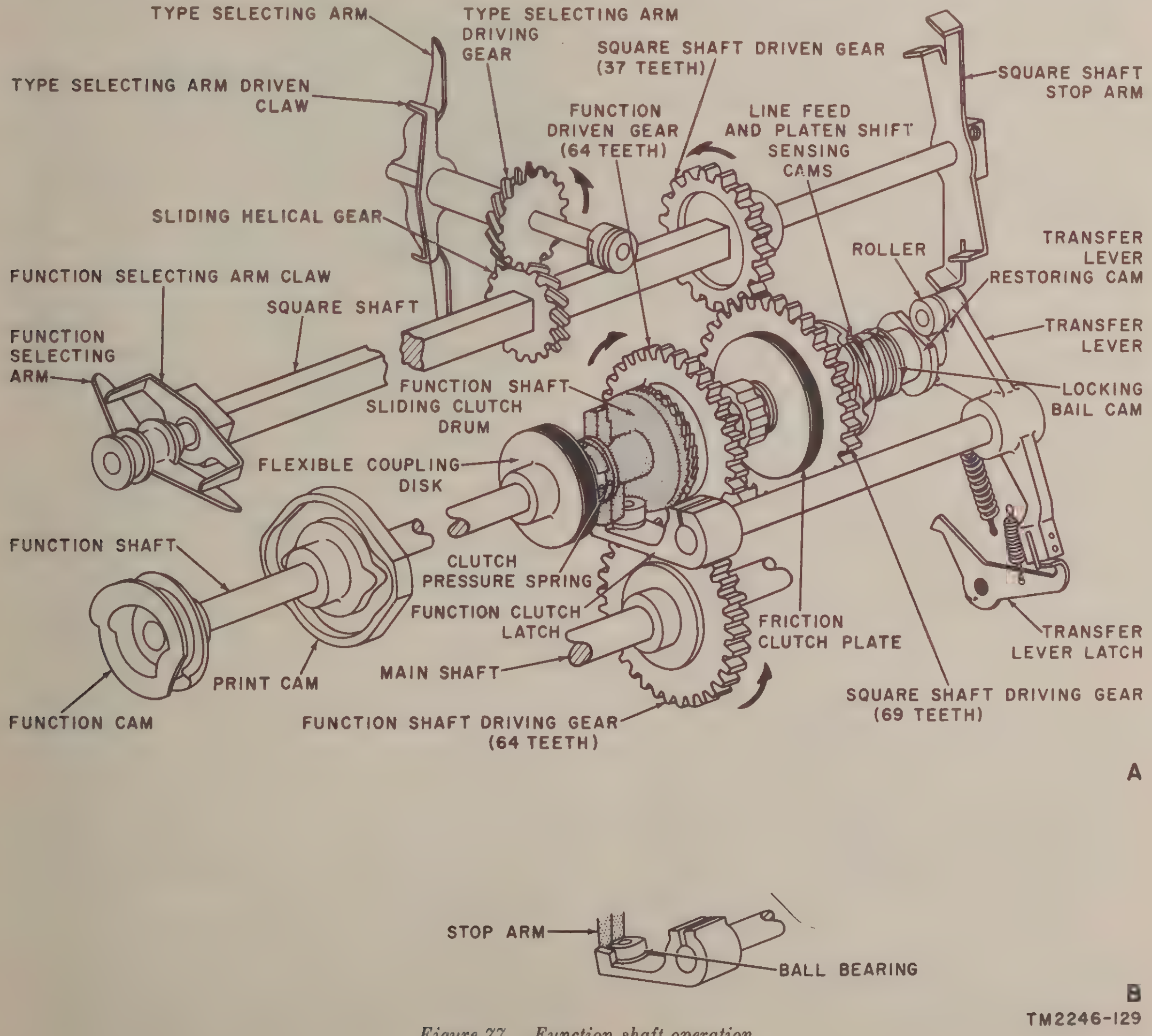

TYPE SELECTING ARM
TYPE SELECTING ARM DRIVING GEAR
SQUARE SHAFT DRIVEN GEAR (37 TEETH)
TYPE SELECTING ARM DRIVEN CLAW
SQUARE SHAFT STOP ARM
FUNCTION DRIVEN GEAR (64 TEETH)
LINE FEED AND PLATEN SHIFT SENSING CAMS
SLIDING HELICAL GEAR
ROLLER
TRANSFER LEVER RESTORING CAM
FUNCTION SELECTING ARM CLAW
SQUARE SHAFT
TRANSFER LEVER
FUNCTION SELECTING ARM
FUNCTION SHAFT SLIDING CLUTCH DRUM
LOCKING BAIL CAM
FLEXIBLE COUPLING DISK
FUNCTION SHAFT
CLUTCH PRESSURE SPRING
FUNCTION CLUTCH LATCH
FRICTION CLUTCH PLATE
TRANSFER LEVER LATCH
PRINT CAM
MAIN SHAFT
SQUARE SHAFT DRIVING GEAR (69 TEETH)
FUNCTION CAM
FUNCTION SHAFT DRIVING GEAR (64 TEETH)
A
STOP ARM
BALL BEARING
B
TM2246-129

Figure 77. Function shaft operation.

engaging the clutch teeth on the function driven gear. The flexible coupling disk is provided to absorb the shocks of clutching and unclutching. The function shaft sliding clutch drum is held in the disengaged position by the ball bearing on the function clutch latch acting against one of the stop arms on the function shaft sliding clutch drum. The function shaft sliding clutch drum is unlatched (for engagement) when the function clutch latch is turned downward, because the ball bearing no longer holds the stop arm.

b. The function clutch latch and transfer lever are fastened to the transfer lever shaft so that the two move simultaneously. Thus, the function shaft sliding clutch drum becomes engaged and causes the function shaft to revolve at the same time the transfer operation occurs. After the function shaft has turned a few degrees, the transfer lever restoring cam on the end of the function shaft lifts the transfer lever which then becomes relatched by the transfer lever latch. This also raises the function clutch latch and when the function shaft has made about one-half revolution, the other stop arm on the function shaft sliding shaft has made about one-half revolution, the other stop arm on the function shaft sliding clutch drum strikes the ball bearing on the function clutch latch to pull the function shaft sliding drum out of engagement. The function clutch latch then holds the stop arm on the function shaft sliding clutch drum from further rotation. (In this disengaging operation, the ball bearing on the function clutch latch acts as a cam surface, exerting force in the axial direction.) The function shaft thus can turn only one-half revolution at a time and does so each time the transfer operation takes place.

c. Operations described in *a* and *b* above are summarized in the following sequence chart.

Receiving Sequence Chart C

1 Transfer lever latch releases transfer lever.
2 Transfer lever, transfer lever shaft, and function clutch latch turn.
3 Function shaft sliding clutch drum unlatched.
4 Function shaft sliding clutch drum engaged.
5 Function shaft starts revolving.

Note. The action described in Receiving Sequence Chart D (printing operation) begins at this point in the sequence of operations.

6 Transfer lever restoring cam lifts transfer lever.
7 T levers move clear of Y-levers and, function clutch latch returns to latching position.
8 Transfer lever latched.

Note. The action described in Receiving Sequence Chart D ends at this point.

9 Near end of ½ revolution of function shaft, function shaft sliding clutch drum arm meets function clutch latch ball bearing.
10 Function shaft sliding clutch drum disengaged.
11 Function shaft sliding clutch drum held by function clutch latch.
12 Function shaft stopped after turning ½ revolution.

63. Printing

a. Basic components of the typing mechanism are shown in figure 78. The 26 type bars that do the actual printing are arranged about an arc on the carriage. Each can pivot to strike the platen and is geared to a mating connecting bar. The type bars are struck against the platen by tapping a type selecting arm (axially) against the connecting bar geared to the particular type bar desired. Choosing the desired type bar is a matter of rotating the type selecting arm to the position behind the desired connecting bar, and each of 26 angular positions corresponds to a different character. Figure 78 shows the type selecting arm turned to one such position. The type selecting arm is rotated through the sliding helical gear on the function shaft and the type selecting arm driving gear, and is stopped at the desired position by arresting the square shaft stop arm. Arresting the stop arm is accomplished by the selector mechanism, which uses code rings set up according to the incoming code impulses.

b. The square shaft stop arm is arrested at the desired angular position by striking against a stop bar which has been moved into the path of the stop arm as it revolves. There are 32 such stop bars arranged in a semicircle about the axis of the square shaft stop arm. The positions of 26 of these correspond to the 26 type bar positions (the other 6 are functions covered in later paragraphs of this section) with each stop bar located in the proper angular position for the corresponding type bar. The particular stop bar corresponding to the letter to be printed thus can be selected by positioning the code rings according to the code for that letter. This is done by the selector-magnet armature, in accordance with the incoming code impulses, operating in conjunction with a series of levers and cams.

c. The square shaft, which drives both the square shaft stop arm to be arrested by the selected stop bar and the type selecting arm, is driven by the function shaft. As the function shaft makes a one-half revolution, the square shaft

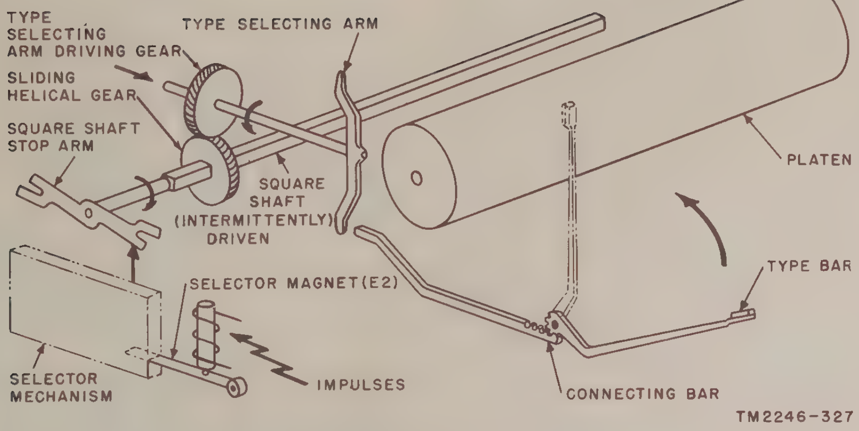


Figure 78. Typing unit basic components.

could make almost a complete turn. However, as it is never necessary for the square shaft stop arm to turn more than a one-half revolution before striking a stop bar, the drive for the square shaft stop arm must be able to slip before the function shaft completes its one-half turn. The square shaft driving gear (fig. 77) is therefore not keyed to the function shaft but is driven through spring-loaded friction clutch plates, which permit the square shaft driving gear to slip on the function shaft as soon as the square shaft stop arm is arrested. Another more important reason for using a friction drive with the square shaft driving gear is the fact that the function shaft must continue to turn after the square shaft stop arm is arrested to actuate the printing or another functioning mechanism.

d. Figure 79 shows parts of the mechanism that print a character. They operate after the type selecting arm has been positioned behind the proper connecting bar and before the function shaft completes its one-half revolution. The type selecting arm is turned by the square shaft through the sliding helical gear, type selecting arm driving gear, and the type selecting arm driven claw. The type selecting arm can be moved axially in and out. The print cam, fixed to the function shaft, lifts the print cam follower each time the function shaft makes a one-half turn (because there are two cam lobes).

e. The print bail blade engages the groove of the round nut on the shaft of the type selecting arm and is fixed to the print bail blade shaft of the cam follower. It rocks forward and backward

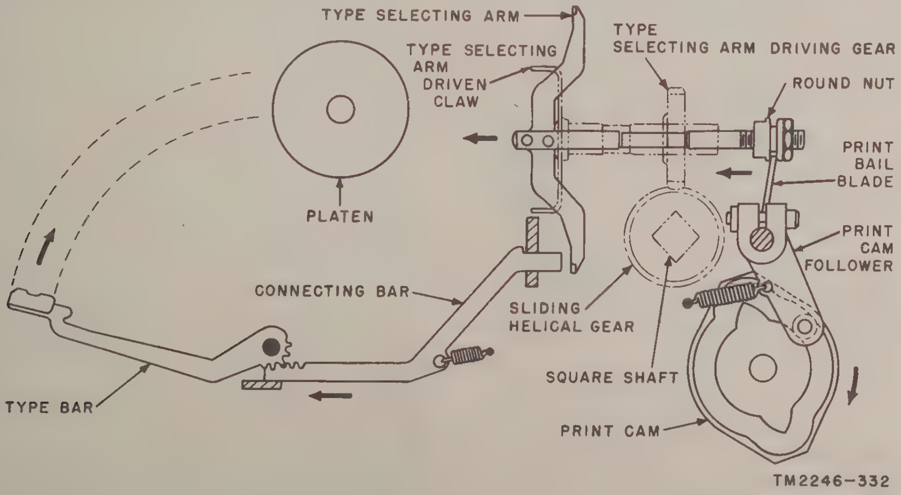


Figure 79. Cross section of teletypewriter showing operation of printing mechanism.

as the print can follower rises and falls. This causes the type selecting arm to plunge forward to strike the connecting bar and causes the type bar to swing toward the platen. The type selecting arm does not push the connecting bar and type bar all the way to the platen; it merely strikes the connecting bar and gives the type bar enough momentum to carry the movement through. The movement of the print bail blade is so fast that the type selecting arm is already drawn all the way back before the type bar reaches the platen. The connecting bar spring pulls the connecting bar and type bar back to their normal positions after the type bar bounces away from the platen.

f. The type selecting arm can stop in 32 different positions, but there are only 26 type bars on the carriage. Therefore, there are six positions of the type selecting arm where no connecting bar and type bar will be struck, even though the print cam operates the print bail blade. Five of these six positions are used for performing other necessary operating functions when printing is not desired. The sixth is for the blank impulse.

g. The operations described in *a* through *f* above are summarized in the sequence chart D, paragraph 65.

64. Functions

The page printing mechanism performs two types of operations. The first operation, the printing of letters and characters is decribed in paragraph 63. The second type of operation, called functions (par. 65–74), consists of rotating the platen for line feed, shifting and unshifting the platen, returning the carriage, spacing across the line, stopping the motor, and ringing the signal bell. The letters (unshift) spacing, motor stop, and signal bell are operated by the function cam and function selecting arm (fig. 80). The figures (shift), line feed, and carriage return are controlled by the function stop bars in the code ring cage.

65. Function Cam and Function Selecting Arm Controlled Functions

a. The function selecting arm is mounted on the end of the square shaft and rotates with the shaft to 32 positions. It moves axially in and out to operate the function punch bars mounted in the punch-bar guide block (fig. 80). However, axial movement does not occur in all 32 positions

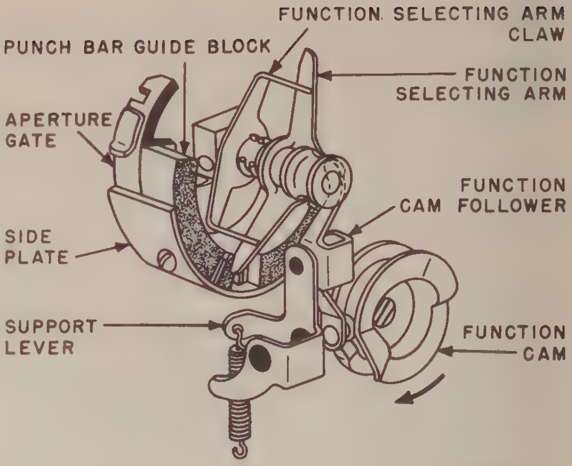


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Figure 80. Function selecting arm mechanism.

as with the type selecting arm. The function cam moves the lower end of the function cam follower each time the function shaft makes one-half revolution. If the function selecting arm is not blocked against axial movement, the function cam follower pivots about its midpoint so that its upper end pushes the arm inward. However, if the function selecting arm is blocked to prevent axial movement, the function cam follower pivots about its upper end and forces the support lever, by which it is mounted at its midpoint, to move. This movement of the support lever feeds the carriage to the right when printing or spacing takes place. Axial movement of the function selecting arm takes place only when functions are performed. When characters are printed or spacing operations take place, the support lever moves.

b. The axial movement of the function selecting arm is governed by the construction of the punch bar guide block and its associated aperture gate. The forward surface of the guide block is cut away in three areas (fig. 81). When the function selecting arm is turned to a position in front of any of the high portions of the punch bar guide block surface (shown shaded in all views), it cannot be moved axially. It can be moved axially only when it is turned to a position in front of one of the cutaway areas. All the function punch bars are mounted in grooves located in the cutaway areas where axial movement for operating them is possible. With three exceptions (the letters H, S, and spacing), the areas which are not cut away correspond to the position to which the function selecting arm is turned when printed characters are selected.

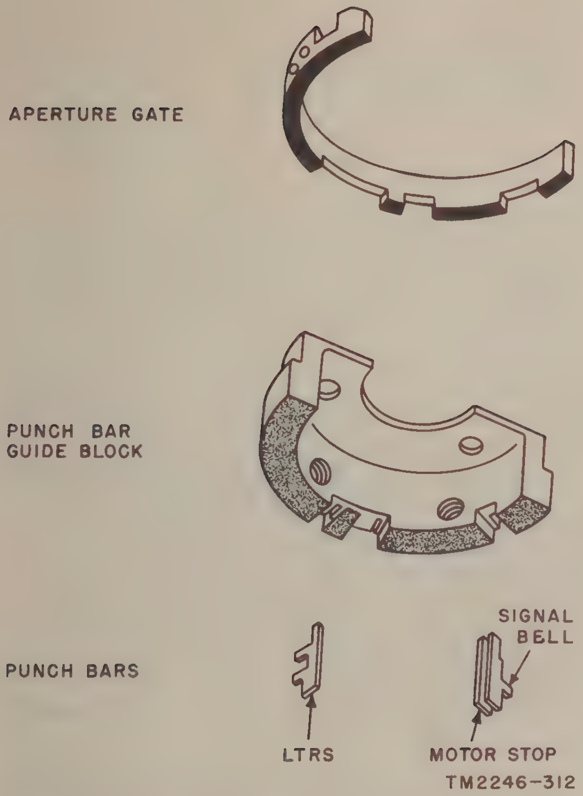

Figure 81. Punch bar guide block, aperture gate, and function punch bars.

c. The letters H and S print only in the letters position of the platen. In the figures position of the platen, they do not print and their position under the function selecting arm is used for operating the punch bar for the motor stop and signal bell functions. These two punch bars must, therefore, be operable in the figures position of the platen and must be inoperable, in order to block the function selecting arm, in the letters position. This is accomplished by the aperture gate which slides in the annular groove formed by the punch bar guide block and the side plate. The position of the aperture gate is controlled by the position of the platen. It has cutaway portions located so that in the letters position the motor stop and signal bell punch bars are blocked, and in the figures position the punch bars are free to move (fig. 82).

d. Figure 83 shows the 32 positions to which the function selecting arm is rotated over the punch bar guide block. It also shows how the cutaway portions of the aperture gate combine with the cutaway portion of the guide block to allow the function selecting arm to move axially, or to be blocked for functions in the two platen positions. The raised portions of the aperture gate are shown black, and the raised portions of the punch bar guide block are shown shaded.

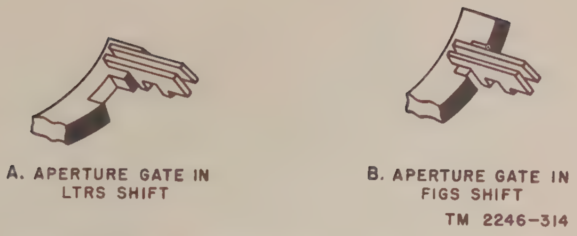
A. APERTURE GATE IN LTRS SHIFT
B. APERTURE GATE IN FIGS SHIFT
TM 2246-314

Figure 82. Motor stop and signal bell punch bars in blocked and unblocked positions.

66. Carriage Feed Operation

a. To prevent characters from being printed one on top of another (strikeovers), the carriage

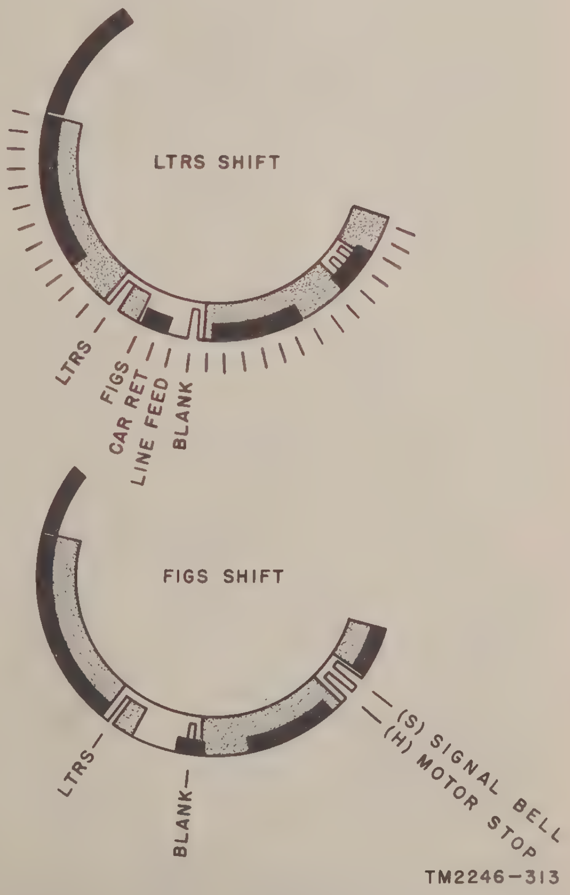

Figure 83. Location of function selecting arm positions, showing aperture gate in blocked and unblocked positions.

Receiving Sequence Chart D

1	Sequence starts with transfer operation; function shaft starts to revolve.			
2	Square shaft stop arm released by previous stop bar unless previous signal was repeated.			
3	Square shaft and type selecting arm rotate unless previous signal was repeated.			
4	Square shaft stop arm arrested by operated stop bar.			
5	Type selecting arm stopped in corresponding positions.			
6	Print cam lifts, print cam follower.	Function cam lifts follower.		
7	Print bail blade rocked forward	Function cam follower pivots about upper end if function selection arm is blocked,[b] or function cam follower pivots about midpoint if function selecting arm is not blocked.[b]		
8	Type selecting arm plunged forward	If function selecting arm is blocked, carriage feeds (see Carriage-feed Sequence Chart, par. 66).		Function selecting arm plunged axially inward.
9*a*	Selected connecting bar struck forward.[a]	Ribbon lifts (see Ribbon Lifter Sequence Chart, par. 75).	Print cam returns print cam follower.	If function selecting arm is not blocked, function punch bar for letters, signal bell, or motor stop is moved inward; no punch bar is struck when carriage return line feed, or figures functions, or blank is selected (see appropriate sequence chart for each function).
9*b*	------------------------------------		Type selecting arm drawn back.	
9*c*	Character printed on paper against platen.			
10	Connecting bar moves back			
11	Ribbon drops (see Ribbon Lifter Sequence Chart).			
12	Function shaft stops turning (see last part of Receiving Sequence Chart C).			

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[a] Except for certain functions.

[b] With platen in letters shift, function selecting arm is blocked for all letters. With platen in figures shift, function selecting arm is blocked for all letters except H and S.

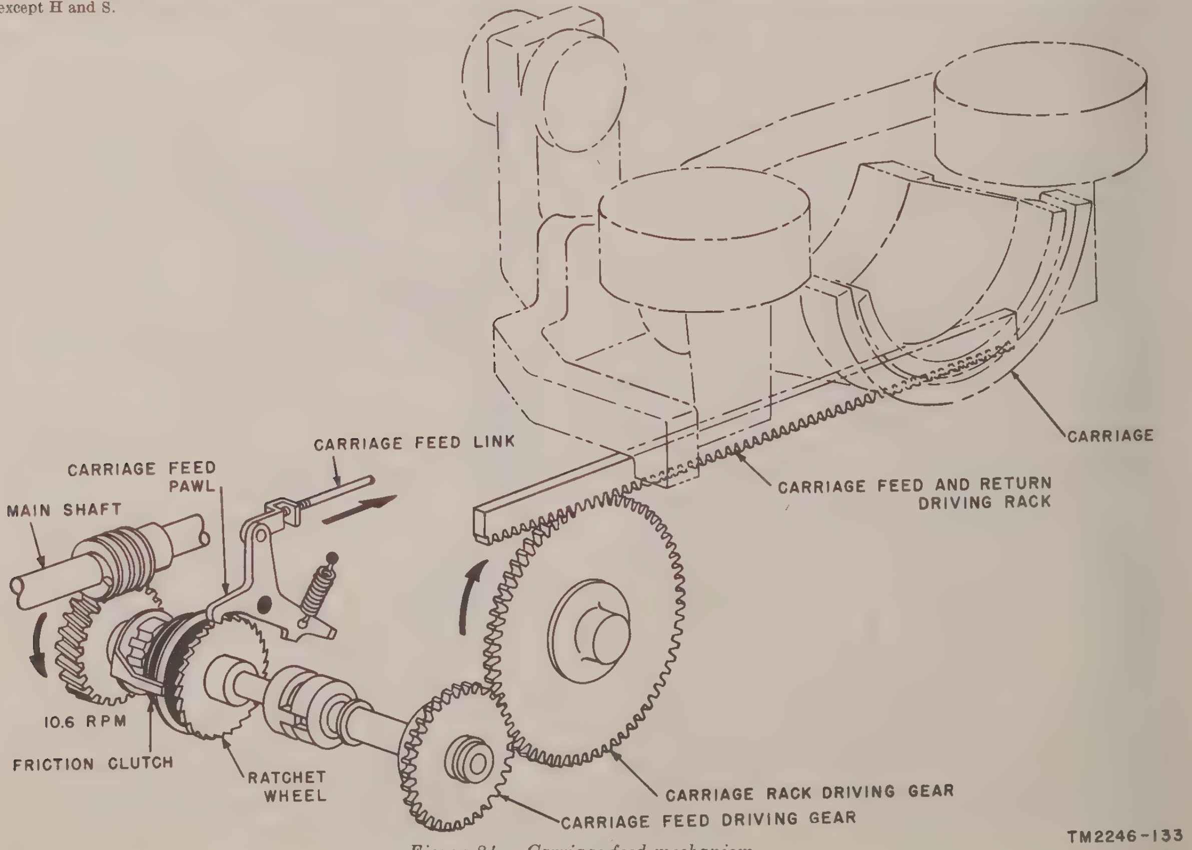


Figure 84. Carriage feed mechanism.

is moved automatically one letter space to the right each time a character is printed or the space bar is depressed. The carriage (fig. 84) which rolls along the guide rail and slides on the square shaft is driven by the carriage rack driving gear and carriage-feed driving gear. When the carriage-feed pawl is disengaged from the ratchet wheel, the carriage-feed driving gear is driven by the main shaft through a friction clutch. The ratchet wheel is released when the carriage feed link attached to the ratchet feed pawl is pulled. The friction clutch then takes hold, the gears turn, and the feed and return driving rack and carriage are moved to the right. The carriage-feed link which pivots the carriage-feed pawl is operated by the function cam (fig. 80) through the support lever which operates the carriage-feed lever. The support lever is turned by lifting the function cam follower whenever the function selecting arm is blocked (as it is for all printed character positions and the space position). The carriage can move only one space each time the feed mechanism is operated because the carriage-feed mechanism is operated because the carriage-feed pawl is repositioned immediately after the one tooth of the ratchet wheel is spaced.

b. The following chart shows the sequence of operation for carriage feeding:

Carriage-Feed Sequence Chart

1 Printed character or space selected.
2 Function cam lifts function cam follower.
3 Function cam follower pivots about its upper end (function selecting arm blocked).
4 Support lever turned.
5 Carriage-feed lever turned.
6 Carriage-feed link pulled.
7 Carriage-feed pawl turned up.
8 Ratched wheel starts turning (friction clutch drive).
9 Carriage moves to right.
10 Function cam returns function cam follower.
11 Support lever turned back.
12 Carriage-feed lever turned back.
13 Carriage-feed link pushed back.
14 Carriage-feed pawl turned down.
15 Nest ratchet wheel tooth engages carriage feed pawl.
16 Ratchet wheel held and carriage stopped (carriage has moved one letter space to right).

c. A manual carriage feed mechanism (fig. 85) is provided to allow the carriage to move to the right without receiving the space impulse. It consists of a vertical link which connects the manual space push button to a bell crank. When the manual space push button is depressed, the bell crank is rotated against the loop in the carriage feed link, pulling the carriage feed pawl out of engagement with the ratchet wheel on the carriage feed shaft. This allows the main shaft to drive the carriage feed driving gear and carriage rack driving gear to move the carriage to the right until the manual space push button is released.

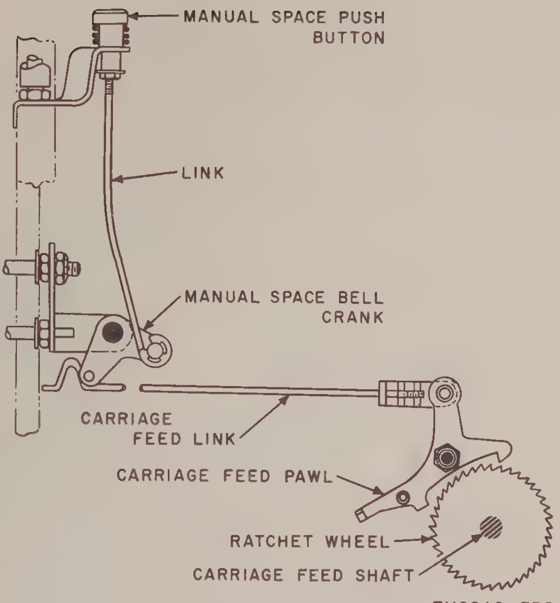


Figure 85. Manual carriage feed mechanism.

67. Carriage-Return Operation

a. The carriage is moved to the left by reversing the direction of rotation of the large carriage rack driving gear (fig. 86). This is accomplished by uncoupling the carriage-feed sliding clutch drum from the small carriage-feed driving gear and engaging the carriage-return sliding clutch drum. Power from the main shaft thus is transmitted to the large carriage-rack driving gear through the carriage-return clutch and the carriage-return driving and driven gears. The carriage-feed sliding clutch drum is uncoupled to permit the small carriage-feed driving gear to idle while the large carriage-rack driving gear rotates in reverse. Both clutches are operated simultaneously, one disengaged, the other engaged, by turning the carriage-return bell crank to pull the horizontal carriage-return link attached to the double blocking lever. The carriage-return clutch lever, which moves with the double blocking lever, engages the carriage-return sliding clutch drum directly and at the same time turns the carriage-feed clutch lever

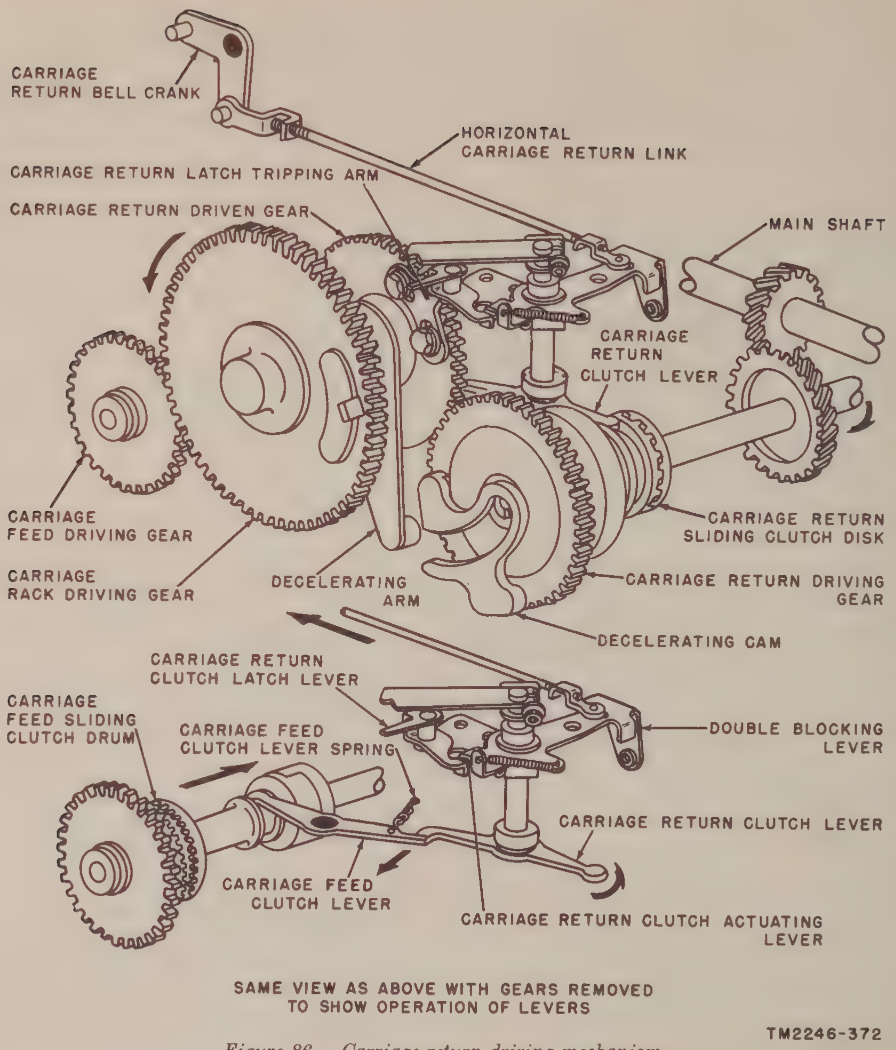

CARRIAGE RETURN BELL CRANK
HORIZONTAL CARRIAGE RETURN LINK
CARRIAGE RETURN LATCH TRIPPING ARM
CARRIAGE RETURN DRIVEN GEAR
MAIN SHAFT
CARRIAGE RETURN CLUTCH LEVER
CARRIAGE FEED DRIVING GEAR
CARRIAGE RETURN SLIDING CLUTCH DISK
CARRIAGE RACK DRIVING GEAR
DECELERATING ARM
CARRIAGE RETURN DRIVING GEAR
DECELERATING CAM
CARRIAGE RETURN CLUTCH LATCH LEVER
CARRIAGE FEED SLIDING CLUTCH DRUM
CARRIAGE FEED CLUTCH LEVER SPRING
DOUBLE BLOCKING LEVER
CARRIAGE RETURN CLUTCH LEVER
CARRIAGE FEED CLUTCH LEVER
CARRIAGE RETURN CLUTCH ACTUATING LEVER
SAME VIEW AS ABOVE WITH GEARS REMOVED TO SHOW OPERATION OF LEVERS
TM2246-372

Figure 86. Carriage-return driving mechanism.

to disengage the carriage-feed sliding clutch drum.

b. The decelerating cam (fig. 86) is used to slow down the movement of the carriage as it approaches the extreme left end of its travel to reduce shock and prevent damage. The decelerating cam is mounted on the carriage-return driving gear and is engaged by the decelerating arm attached to the carriage return driven gear. The decelerating arm engages the cam only when the gears have turned the carriage to within approximately seven-eights inch of the left end. No teeth are provided on that portion of the carriage return driven gear that would be in mesh when the decelerating arm and decelerating cam are engaged so that the driving action is transferred from between the gear teeth to between the decelerating cam and decelerating arm. The decelerating cam and decelerating arm continue the driving action between the gears, but, as the decelerating arm moves farther into the cam opening, the turning ratio between the two becomes smaller and smaller. That is, the carriage-return driven gear turns through a smaller and smaller angle for the same angular movement of the carriage-return driving gear and thus decelerates the carriage motion.

c. Both the carriage return and carriage feed are held in the position shown in figure 86 throughout the carriage return-movement by the holding action of the carriage-return clutch latch actuating against the carriage-return clutch latch lever. When the carriage reaches the end of its travel, the carriage-return clutch latch lever is disengaged by the carriage-return latch tripping arm mounted on the carriage-return driven gear. If for any reason, the carriage-return clutch does not disengage, further action of the carriage-return driven gear causes the carriage-return latch tripping arm to contact the throwout lever. The throwout lever pivots the carriage-return clutch lever, disengaging the carriage-return clutch. This permits the carriage feed clutch spring attached to the carriage feed clutch lever to return the levers and clutches to the carriage feed position (the carriage return sliding clutch drum disengaged, and the carriage feed sliding clutch drum reengaged).

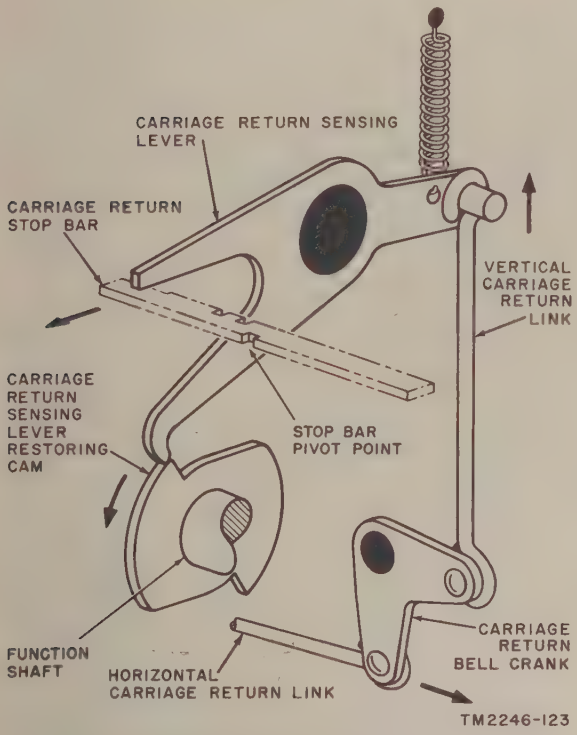

CARRIAGE RETURN SENSING LEVER
CARRIAGE RETURN STOP BAR
VERTICAL CARRIAGE RETURN LINK
CARRIAGE RETURN SENSING LEVER RESTORING CAM
STOP BAR PIVOT POINT
FUNCTION SHAFT
HORIZONTAL CARRIAGE RETURN LINK
CARRIAGE RETURN BELL CRANK
TM2246-123

Figure 87. Carriage return operating mechanism as seen from the rear of the teletypewriter.

d. The pulling of the horizontal carriage-return link by turning the carriage-return bell crank is accomplished by the mechanism shown in figure 87 when the carriage-return stop bars are operated. The function stop bar shown in figure 87 is the one for the carriage return function. The stop bar (like the other two function stop bars) has an extension on the rear side of the code ring cage, which normally engages the sensing lever.

e. The sensing lever therefore is released only when the carriage-return stop bar is operated. The carriage-return sensing lever restoring cam, which is mounted on the function shaft, turns one-half revolution every time any stop bar is operated as the result of the transfer operation. Thus, whenever the carriage-return stop bar is operated, the sensing lever drops to the low point of the carriage-return sensing lever restoring cam and pulls the vertical carriage return link that turns the carriage-return bell crank. Before the carriage-return sensing lever restoring cam completes its one-half revolution, the carriage return sensing lever is restored to its initial position ready to be held there by the carriage-return stop bar when the carriage-return stop bar moves back as a result of another code group.

f. The hole by which the horizontal carriage-return link is attached to the double blocking lever (fig. 86) is elongated. This elongation is provided to allow the horizontal carriage-return link to move back to its unoperated position when the carriage-return sensing lever is restored even though the carriage-return clutch actuating lever is still latched. This is necessary because it takes approximately three times as long for the carriage to return as it does for the function to make a one-half revolution.

g. The carriage-return clutch cannot be engaged when the carriage is in its extreme left hand position because the adjusting plate of the double blocking lever will engage the end of a carriage-return blocking lever. The double blocking lever cannot move; therefore the carriage clutch cannot be engaged. As soon as the carriage is moved one space, the carriage-return blocking lever moves downward enough to clear the end of the double blocking lever so that it can move (if a carriage return code group is received) sufficiently to operate the carriage return clutch.

h. A manual carriage return mechanism allows the operator to return the carriage to the left-hand margin without receiving carriage return signals. Pushing the manual CAR. RET. push button on the right front of the dust cover causes the push button lever to pivot and the manual carriage-return lever trip pawl (fig. 88) to move the double blocking lever counterclockwise so that the carriage return mechanism operates as described above. To prevent damage to the operating mechanism by pushing the double blocking lever too far, the trip pawl is automatically disengaged by the adjusting screw as soon as it has caused the mechanism to latch. When the manual CAR. RET. push button is released, the entire manual carriage return mechanism is pulled back by the trip pawl spring to its unoperated position against a stop pin.

i. The operations described in this paragraph are summarized in the sequence in which they occur in the following chart:

Carriage-Return Sequence Chart

1	Carriage return signal received.		
2	Transfer lever released.		
3	Code rings alined for carriage return stop bar.		Function shaft starts revolving.
4	Carriage-return stop bars operated.		Carriage-return sensing lever restoring can turns past carriage-return sensing lever.
5	Carriage-return sensing lever released.		
6	Vertical carriage-return link pulled up.		
7	Carriage-return bell crank turned.		
8	Horizontal carriage-return link pulled.		
9	Double blocking lever turned and latched.		
10	Carriage-return clutch lever turned.	Carriage feed clutch lever turned.	Carriage-return sensing lever raised by carriage-return sensing lever restoring cam.
11	Carriage-return clutch drum engaged.	Carriage feed clutch drum disengaged.	Carriage-return bell crank and horizontal carriage-return link moved back.
12	Carriage-return driving gear turns carriage-return driven gear and large carriage rack driving gear to move carriage to left.	Small carriage feed driving gear idles.	Function shaft stops (after completing ½ turn.)
13	Carriage nears left end of travel.		Carriage-return stop bar latches carriage-return sensing lever on next signal.
14	Decelerating arm engages decelerating cam.		
15	Carriage-return driven gear teeth clear carriage-return driving gear teeth.		
16	Carriage decelerates.		
17	Carriage-return latch tripping arm strikes carriage-return clutch latch lever.		
18	Double blocking lever released. Carriage-return latch tripping arm contacts throwout lever.		
19	Carriage feed clutch lever and carriage-return clutch lever pulled back (spring action).		
20	Carriage-return clutch drum disengaged.		Carriage feed clutch drum re-engaged.
21	Carriage stopped at left margin.		

68. Carriage-Return Safety Clutch

A considerable amount of force is applied when the carriage-return mechanism drives the carriage to the left margin. To prevent serious damage resulting from the sudden stop caused by an obstruction of the carriage return mechanism, the carriage-return driving gear is powered by a friction clutch. This friction clutch allows the carriage-return driving gear to slip if the travel is blocked. The carriage-return driving gear itself is free to turn, but it is coupled to the carriage-return sliding clutch drum (fig. 89) by means of friction plates on both sides. Pressure for creating the necessary friction is obtained by compressing the spring by means of the adjusting collar.

69. Figures Shift Mechanism

a. The platen is shifted or raised in position to print figures and other upper-case characters by the operation of the figures shift mechanism. When the FIGS key is depressed, the figures stop bar moves out of the path of the figure shift sensing lever (fig. 90). The figure shift sensing lever drops to the low point of the figures sensing lever restoring cam. In doing so, it pushes the platen shift cam follower to the right so that its roller moves under the platen shift operating cam. As the function shaft revolves, the lobe on the platen shift operating cam pulls the platen shift cam follower down to print the platen shift bell crank. The platen shift bell crank moves the platen shift link toward the rear of the machine, pulling the platen shift arm. The platen shift arm raises the platen support frame and platen. The upward movement of the platen is limited by the bumper on the platen bracket. As the platen rises, it moves the platen latching arm (fig. 91) down at the end where it engages the aperture gate. After the low point of the platen shift operating cam passes the roller, the platen shift cam follower and platen shift bell crank are

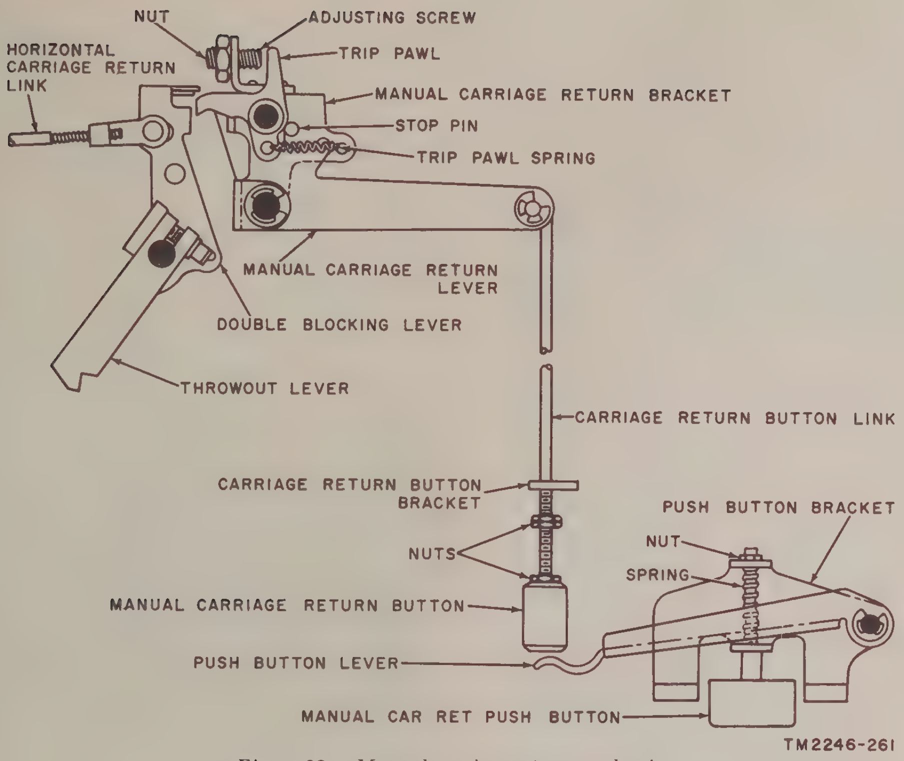

NUT
ADJUSTING SCREW
HORIZONTAL CARRIAGE RETURN LINK
TRIP PAWL
MANUAL CARRIAGE RETURN BRACKET
STOP PIN
TRIP PAWL SPRING
MANUAL CARRIAGE RETURN LEVER
DOUBLE BLOCKING LEVER
THROWOUT LEVER
CARRIAGE RETURN BUTTON LINK
CARRIAGE RETURN BUTTON BRACKET
PUSH BUTTON BRACKET
NUTS
NUT
SPRING
MANUAL CARRIAGE RETURN BUTTON
PUSH BUTTON LEVER
MANUAL CAR RET PUSH BUTTON
TM2246-261

Figure 88. Manual carriage return mechanism.

restored to the starting position by the platen shift bell crank spring. At the same time the lobe of the figures sensing lever restoring cam raises the figure shift sensing lever. The figures stop bar will block the figure shift sensing lever if another code group is received, selecting a different stop bar. The platen is retained in the shifted position by the platen latch which engages a lug on the semicircular aperture gate.

b. The operations described in this paragraph are summarized in the following chart:

Figures-Shift Sequence Chart

1 Figures code group received.
2 Transfer lever released.
3 Code rings aligned for figures stop bar. Function shaft starts turning.
4 Figure stop bar operated.
5 Figure shift sensing lever drops to low part of figures sensing lever restoring cam.
6 Figure shift sensing lever moves platen shift cam follower laterally.
7 Platen shift cam follower roller engages (turning) platen shift operating cam.
8 Platen shift cam follower pulled down by platen shift operating cam.
9 Platen shift bell crank turns.
10 Platen shift link pulled.
11 Platen support frame tilted upward.
12 Platen latching arm and aperture gate moved down and latched.
13 Figures sensing lever restoring cam raises figure shift sensing lever.
14 Platen shift cam follower disengages from platen shift operating cam.
15 Platen shift operating cam releases platen shift cam follower.
16 Platen shift cam follower moves laterally to original position by spring tension.
17 Function shaft stops turning.
18 Platen remains latched in figures position until letters code group is received.

70. Line Feed Operation

a. The platen is turned to feed the paper one or two spaces by the operation of the line feed mechanism, depending on the position of the single double line feed lever.

b. The platen either can be held in a given position or can be turned one or two line spaces at a time by the detent wheel attached to it (fig. 92). To keep the platen from turning while printing, the detent wheel is held by the line spacing detent (fig. 93). When line feeding, the detent wheel is turned one space or two spaces by the line feed pawl. The line feed lever on which the line feed pawl is mounted pivots about the platen shaft.

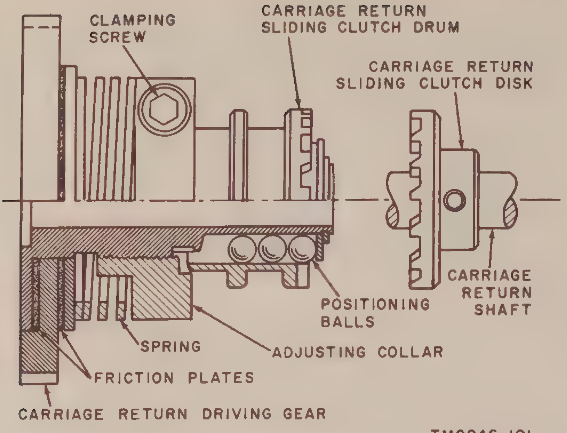


Figure 89. Carriage-return safety clutch.

Moving the upper end of the line feed lever to rear of the machine causes the line feed pawl to engage and turn the detent wheel with sufficient force to overcome the grip of the line spacing detent. After the platen has been turned one or two line spaces, the line spacing detent engages the next tooth or the second tooth of the detent wheel to hold the platen in the advanced position. The line feed lever is actuated by turning the adjustable bell crank to pull the connecting link. The adjustable bell crank is operated by the parts shown on the lower left-hand side of figure 93 whenever the line feed stop bar is operated.

c. The line feed operating cam and the line feed cam follower become engaged only when the line feed code group is received. When this occurs, the line feed sensing lever is released by the operation of the line feed stop bar and drops to the low point of the line feed sensing lever restoring cam right after the function shaft starts turning. (The line feed sensing lever is pulled downward by the line feed sensing lever spring.) In its downward movement, the line feed sensing lever pushes against the two sloping projections on the upper part of the line feed cam follower to make the line feed cam follower shift to the left of the function shaft. This movement causes the roller on the lower end of the line feed cam follower to move under the line feed operating cam. As the function shaft makes its one-half revolution, the line feed operating cam pulls the line feed cam follower downward to turn the adjustable bell crank. The mating surfaces of the line feed operating cam and the roller on the line feed cam follower are beveled approximately 15° so that, as the line feed operating cam turns, it holds the line feed cam follower engaged even though it has moved clear of the line feed sensing lever. After the lobe of the line feed operating cam has passed, the adjustable bell

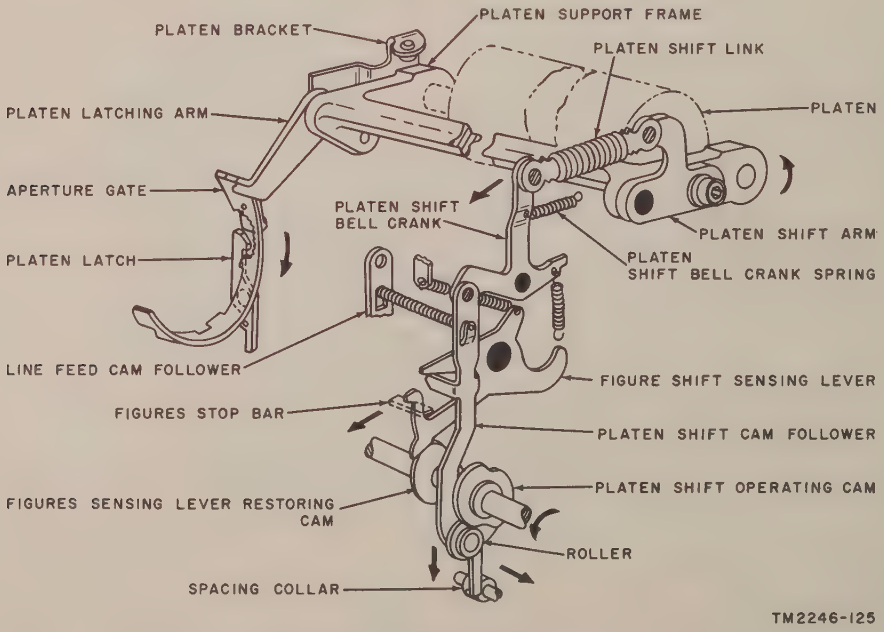


Figure 90. Figures-shift mechanism.

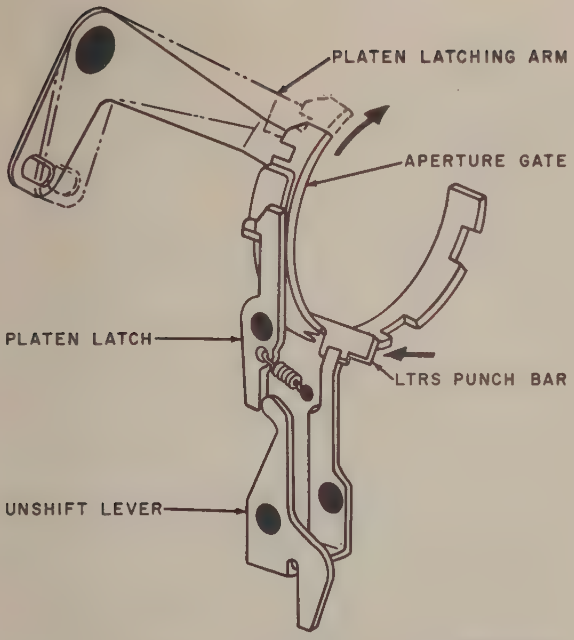


Figure 91. Aperture gate latched.

crank is pulled back to its starting position by the bell crank spring. Turning the adjustable bell crank operates the platen line feed mechanism as explained above. The line feed sensing lever is raised by the line feed sensing lever restoring cam. As the function shaft completes its one-half revolution, the low part of the line feed operating cam is opposite the roller and the line feed cam follower is pulled to the right by the spring. The line feed stop bar will block the line feed sensing lever if another code group is received, selecting another stop bar.

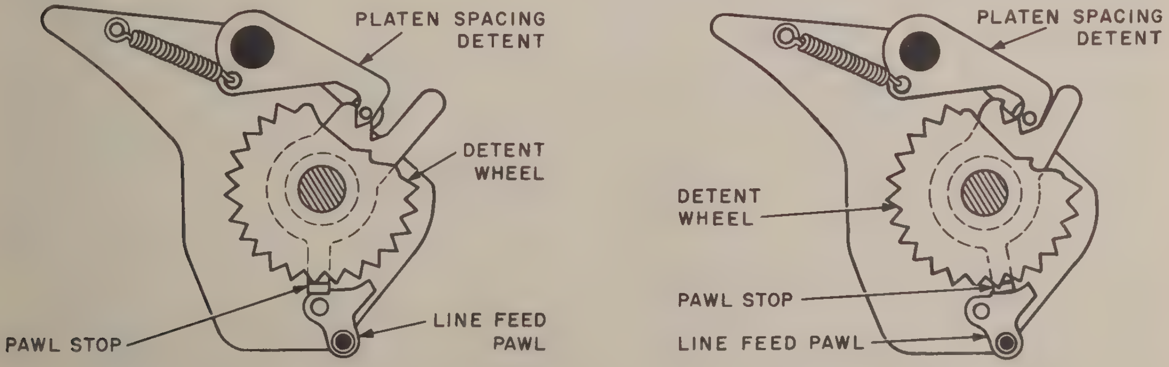
d. The operations described in this paragraph are summarized in the following chart:

Line Feed Sequence Chart

1 Line feed code group received.
2 Transfer lever released.
3 Code rings alined to accept the line feed stop bar. Function shaft starts turning.
4 Line feed stop bars operated.
5 Line feed sensing lever released by function stop bar.
6 Line feed sensing lever drops to low point of line feed sensing lever restoring cam.
7 Line feed sensing lever thrusts line feed cam follower laterally.
8 Line feed cam follower roller engages (turning) line feed operating cam.
9 Line feed cam follower pulled down by line feed operating cam lobe.
10 Adjustable bell crank turned.
11 Connecting link pulled.
12 Connecting lever turned.
13 Line feed pawl engages detent wheel.
14 Detent wheel and platen turn one or two line spaces.
15 Line feed sensing lever restoring cam raises line feed sensing lever.
16 Line feed cam follower rolls off line feed operating cam lobe.
17 Adjustable bell crank and connecting link return to original position (spring return).
18 Line feed lever turned back.
19 Line feed pawl disengages detent wheel.
20 Line feed operating cam releases line feed cam follower.
21 Line feed cam follower shifts laterally to original position (spring action). Function shaft stops turning.
22 Line feed sensing lever blocked by line feed stop bar on next signal (unless line feed group is repeated).

71. Letters Mechanism

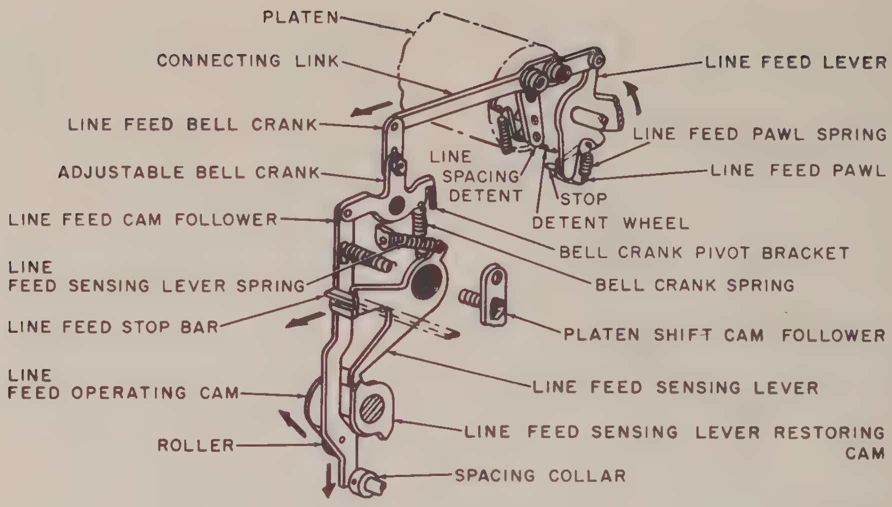
a. The platen is returned to the letters position from the figure position by the operation of the



A. DOUBLE LINE FEED

B. SINGLE LINE FEED

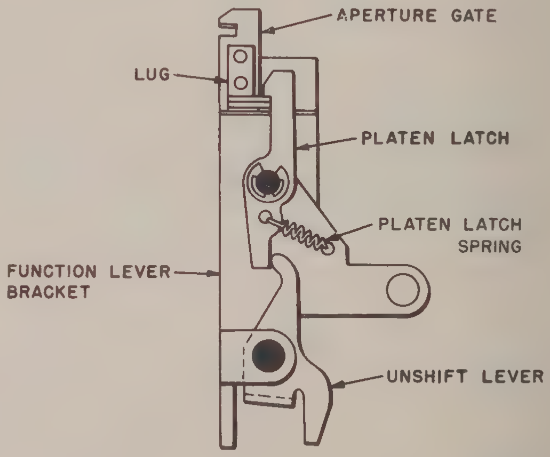
Figure 92. Single double line feed mechanism.



TM2246-333

Figure 93. Line feed operating mechanism.

letters mechanism. When the letters code group is received, the function selecting arm is positioned over the letters punch bar. As the function shaft rotates the function cam pivots the function cam follower (fig. 80), which causes the function selecting arm to move axially and push in the letters punch bar (fig. 91). As the letters punch bar is pushed in, it turns the unshift lever, which forces the platen latch out of engagement with the lug on the aperture gate. The aperture gate is released and the platen drops down from its own weight to the letters position (fig. 94). The function cam follower (fig. 80) continues to rotate until the function selecting arm is moved out of engagement with the letters punch bar. The letters punch bar, the unshift lever, and the platen latch return to their original position, through spring action. The platen stop bracket (fig. 90) maintains the platen in the letters position by having the platen support frame rest against an adjustable stop screw in the platen stop bracket.



TM2246-109

Figure 94. Platen latching mechanism (letters position).

b. The letters platen blocking mechanism (fig. 95) is operated by the movement of the platen. When the platen moves into the letters position, the platen blocking arm bracket, mounted on the lower left side of the platen support frame (when viewed from the front), moves the platen blocking arm, which is mounted to it, and causes it to become latched by the platen lower case latch. With the platen blocking arm latched, the platen cannot move from the letters position until a figures code group is received. When the figures code group is received, the figure shift sensing lever moves the platen lower case latch away from the platen blocking arm. The platen now is free to move to the figures position.

c. The operations described in this paragraph are summarized in the following chart:

Letters Sequence Chart

1 Platen is in figures position.
2 Letters code group received.
3 Function selecting arm positioned over letters punch bar.
4 Function cam pivots function cam follower about support lever.
5 Function selecting arm plunged axially.
6 Letters punch bar pushed in.
7 Unshift lever turned.

8 Platen latch turned.
9 Aperture gate released.
10 Platen drops.
11 Platen blocking arm latched by platen lower case latch.
12 Function cam pivots function cam follower about support lever.
13 Function selecting arm pulled back.
14 Letters punch bar, unshift lever, and platen latch return to original position (spring return).

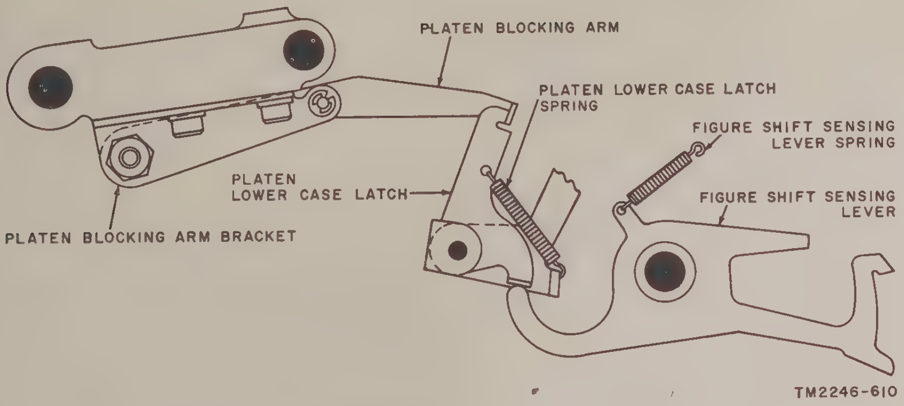

PLATEN BLOCKING ARM
PLATEN LOWER CASE LATCH SPRING
FIGURE SHIFT SENSING LEVER SPRING
FIGURE SHIFT SENSING LEVER
PLATEN LOWER CASE LATCH
PLATEN BLOCKING ARM BRACKET
TM2246-610

Figure 95. Platen blocking mechanism (letters position).

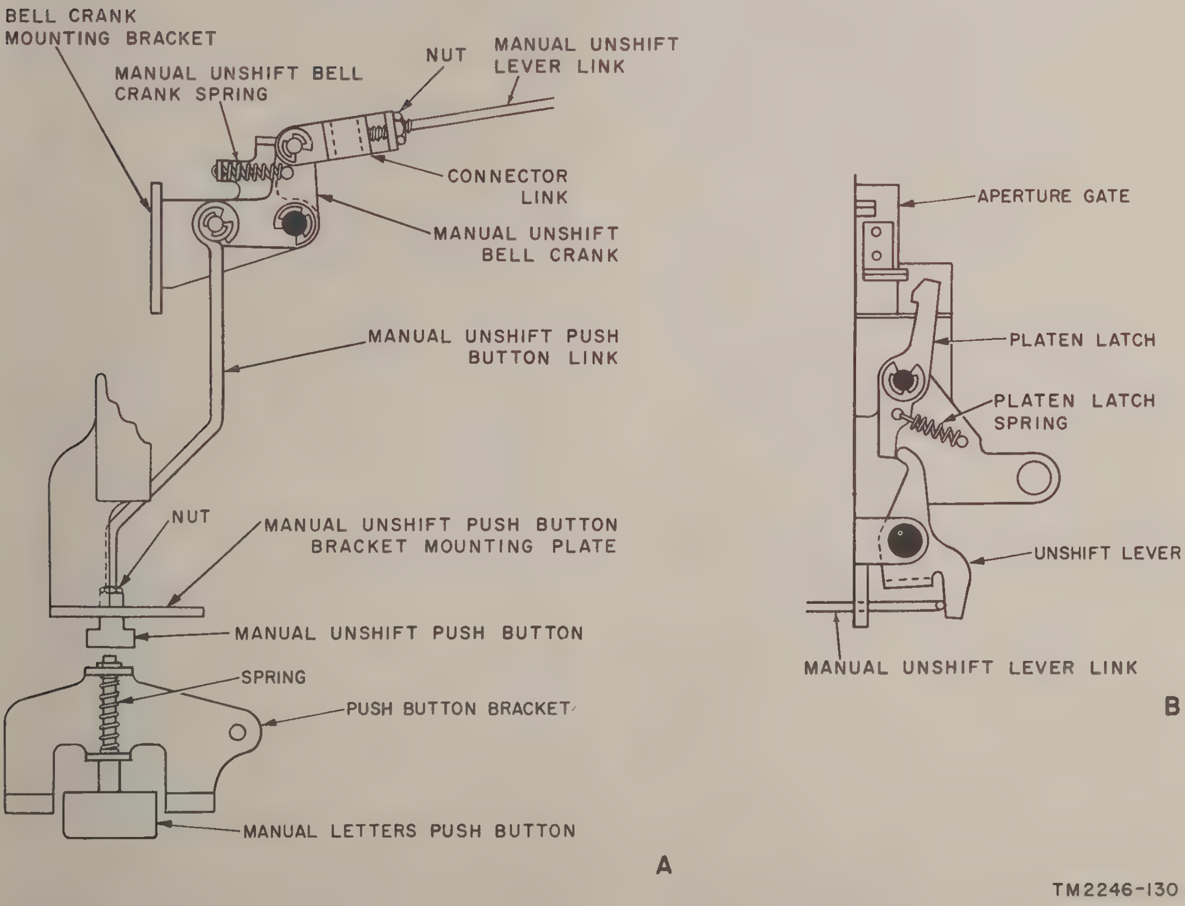

BELL CRANK MOUNTING BRACKET
MANUAL UNSHIFT BELL CRANK SPRING
NUT
MANUAL UNSHIFT LEVER LINK
CONNECTOR LINK
MANUAL UNSHIFT BELL CRANK
MANUAL UNSHIFT PUSH BUTTON LINK
NUT
MANUAL UNSHIFT PUSH BUTTON BRACKET MOUNTING PLATE
MANUAL UNSHIFT PUSH BUTTON
SPRING
PUSH BUTTON BRACKET
MANUAL LETTERS PUSH BUTTON
A
APERTURE GATE
PLATEN LATCH
PLATEN LATCH SPRING
UNSHIFT LEVER
MANUAL UNSHIFT LEVER LINK
B
TM2246-130

Figure 96. Manual letters mechanism.

d. A manual letters mechanism (fig. 96) is supplied to allow the operator to unshift the platen from the figures position without receiving the letters signal code group. When the manual letters push button (A, fig. 96) on the left front of the dust cover is depressed it causes the manual unshift bell crank to rotate and move the manual unshift lever link to the right (when viewed from front). The manual unshift lever link strikes the unshift lever extension and causes it to rotate and move the platen latch out of engagement with the lug on the aperture gate. The platen then drops into letters position by its own weight. When the manual letters push button is released, the entire mechanism is returned to its original position through the action of the platen latch spring and manual unshift bell crank spring.

72. Signal Bell Operation

a. The signal bell sounds to alert the operator when the code group for the signal bell is received while the platen is in figures position. The function selecting arm (fig. 80) is positioned over the signal bell punch bar. The function cam then pivots the function cam follower and causes the function selecting arm to move axially and push in the signal bell punch bar (fig. 97). In the figures position the aperture gate does not block the movement of the signal bell punch (B, fig. 82). The signal bell punch bar moves the signal bell clapper. Momentum then causes the signal bell clapper to strike the signal bell. The function cam then pivots the function cam follower in the opposite direction and pulls back the function selecting arm. The signal bell punch bar and signal bell clapper are returned to their original position by the signal bell clapper spring.

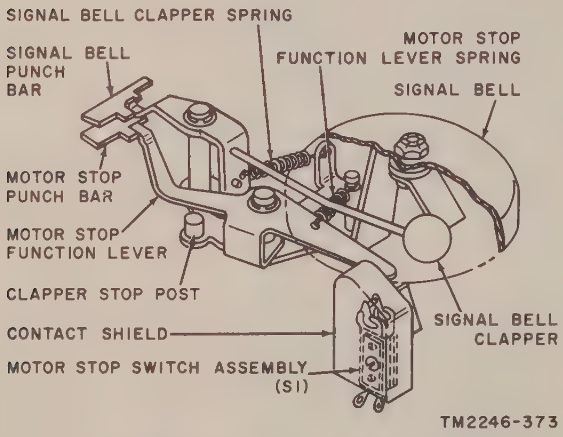

SIGNAL BELL CLAPPER SPRING
SIGNAL BELL PUNCH BAR
MOTOR STOP FUNCTION LEVER SPRING
SIGNAL BELL
MOTOR STOP PUNCH BAR
MOTOR STOP FUNCTION LEVER
CLAPPER STOP POST
SIGNAL BELL CLAPPER
CONTACT SHIELD
MOTOR STOP SWITCH ASSEMBLY (S1)
TM2246-373

Figure 97. Signal bell and motor stop actuating mechanisms.

b. The sequence of operation of the signal bell is shown in the following chart:

Signal Bell Sequence Chart

1 Signal bell code group received with platen in figures position.
2 Function selecting arm positioned over signal bell punch bar.
3 Function cam pivots function cam follower about support lever.
4 Function selecting arm plunged axially.
5 Signal bell punch bar moved in.
6 Signal bell clapper moves.
7 Signal bell clapper hits clapper stop post.
8 Signal bell clapper momentum carries it farther to strike signal bell.
9 Function cam pivots function cam follower about support lever.
10 Function selecting arm pulled back.
11 Signal bell punch bar and signal bell clapper return to original position against clapper stop (spring return).

73. Motor Stop Operation

a. The motor stop operation places the unit in a stand-by condition and enables a connected station to restart the unit. It is controlled by means of a set of relays which open the circuit to the page printer motor, and hold it open until the signal line circuit is broken and again closed. To stop the motor, the H key is depressed while the platen is in the figures position. As a result, the function selecting arm is positioned over the motor stop bar (fig. 97). The function cam pivots the function cam follower and causes the function selecting arm to move axially and strike the motor stop punch bar. As the motor stop punch bar moves it pivots the motor stop function lever and causes the contacts of the motor stop switch (S1) to operate. This causes the motor stop relay to energize and opens the motor circuit, stopping the motor. The function cam then pivots the function cam follower in the opposite direction and causes the function selecting arm to be pulled away from the motor stop punch bar. The motor stop punch bar, the motor stop function lever, and the contacts of the motor stop switch (S1) return to their original positions through the action of the motor stop function lever spring. To start the motor again, an operator must first break, then close, the signal line by operating the LINE BREAK switch (S3). The motor will start only after the signal line is closed.

b. The chart below lists in sequence the operation of the motor stop operation.

Motor Stop Operation Sequence Chart

1 Platen in figures position; H key depressed; and contacts of motor stop switch (S1) operated.
2 Function selecting arm positioned over motor stop punch bar.
3 Function cam pivots function cam follower about support lever.
4 Function selecting arm plunged axially.
5 Motor stop punch bar pushed in.
6 Motor stop function lever pivots.
7 Contacts of motor stop switch (S1) operate, energizing relays A and B of motor stop relay (E1) (par. 114*d*).
8 Motor circuit opened; motor stops; keyboard circuit locked out.
9 Relays A and B are energized as long as line current is maintained.
10 When next break in line current occurs, relay B releases; relay A stays energized (par. 114*d*).
11 On next closing of line current, relay A releases.
12 Contacts of motor stop relay (E1) return to normal.
13 Motor starts.

74. Automatic Carriage-Return and Line Feed Operation

Automatic carriage return and line feed is initiated when the carriage reaches the right-hand margin. At the 73d character, the right-hand margin trip plate, mounted on the type selecting arm bearing cap of the carriage frame, rotates the stop bar shift lever (fig. 98). This causes the stop bar shift link, stop bar shift blade, and stop bar shift stop to move in a horizontal direction to the left (when viewed from front). The stop bar shift blade moves the carriage return and line feed function stop bars into the code ring cage and away from their sensing levers, while the spring collar compresses the stop bar return spring against the stop bar shift link bracket. The entire mechanism actuated by the right-hand margin trip plate then is held in this operated position by the delaying latch which engages the stop bar shift stop. Since the carriage return and line feed sensing levers are now free to operate, both carriage return and line feed take place on the next operation of the function shaft. When the carriage reaches the left-hand margin, the lefthand margin trip plate rotates the delaying lever. This moves the delaying latch away from the stop bar shift stop. The stop bar return spring then returns the automatic carriage return and line feed mechanism to its normal unoperated position and moves the function stop bars back under their associated sensing levers.

75. Inking Ribbon Lifter Operation

a. The normal position of the inking ribbon is below the printing line. In order not to obscure the printing, the inking ribbon must be raised and lowered to print each character. The mechanism which performs this operation is shown in figure 99. The ribbon guide through which the inking ribbon is threaded can slide up and down on its mounting and is lifted when the ribbon vibrator bell crank is turned. The ribbon vibrator bell crank is actuated by means of the linkage shown in figure 99 when the type selecting arm pushes the first lever of the ribbon vibrator lever and bracket (at the same time that it taps the type bar actuating connecting bar). Since the inking ribbon must be raised higher for printing figures than for printing letters, the point about which the lever of the ribbon vibrator bell crank turns is not fixed but is mounted on a pivot bearing. The pivot bearing can be raised and lowered in accordance with the platen position by means of the bar of the platen trough. Thus, the inking ribbon is in a raised position for figures and in a lowered position for letters but moves in the same manner in both positions.

b. The sequence of operations by the inking ribbon lifter mechanism is shown in the chart below.

Inking Ribbon Lifter Sequence Chart

1 Type selecting arm turns to selected position.
2 Type selecting arm plunged forward.
3 The first lever of ribbon vibrator lever and bracket struck.
4 Linkage turns ribbon vibrator bell crank. Type selecting arm pulled backward.
5 Ribbon guide lifted.
6 Type bar strikes inking ribbon against platen.
7 Ribbon guide, ribbon vibrator bell crank, and ribbon vibrator lever and bracket returned to original position by ribbon vibrator bell crank spring.

76. Inking Ribbon Feeding Operation

a. The inking ribbon is pulled a short distance through the ribbon guide each time a character is printed to provide uniformly printed impressions. The inking ribbon feed mechanism is mounted on the carriage, and is shown in figure 100. Both printing ribbon spools are mounted on ribbon spool drive shafts. The ribbon spool driving gear on the lower end of one or the other of these ribbon spool drive shafts always is engaged with

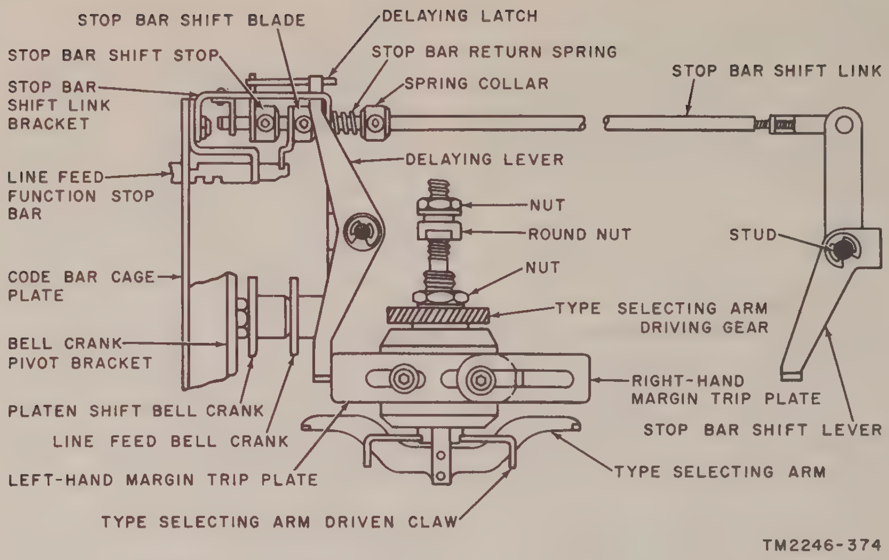


Figure 98. Automatic line feed and carriage return control.

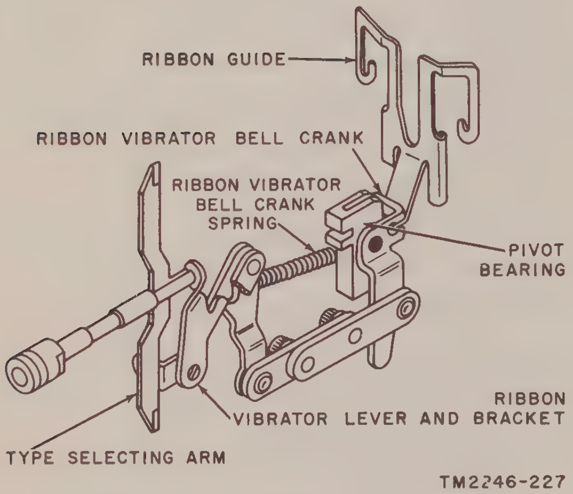

RIBBON GUIDE
RIBBON VIBRATOR BELL CRANK
RIBBON VIBRATOR BELL CRANK SPRING
PIVOT BEARING
RIBBON VIBRATOR LEVER AND BRACKET
TYPE SELECTING ARM
TM2246-227

Figure 99. Inking ribbon lifter mechanism.

a bevel gear on the drive shaft. The helical gear on the drive shaft mates with the ribbon feed rack which is part of the guide rail of the carriage. Movement of the carriage to the right causes the helical gear, drive shafts, and one printing ribbon spool to turn and wind up part of the inking ribbon. The other printing ribbon spool idles and an equivalent amount of inking ribbon unwinds from it. This inking ribbon is kept taut by the spool friction spring of the paying-out printing ribbon spool. When the carriage is returned to the left, the helical gear turns in the opposite direction but the jaw clutch teeth slip so that the drive to the ribbon spools is effectively disengaged, preventing the inking ribbon from unwinding.

b. Sequences of operation of inking ribbon feed are shown in the chart below.

Inking Ribbon Feed Mechanism Sequence Chart

1 Carriage fed one space to right (when printing or spacing operation takes place).
2 Helical gear turns bevel gears on one end (depending on direction of ribbon feed) and the printing ribbon spool.
3 Inking ribbon pulled through the ribbon guide one space.
4 Above sequence repeats for each advance of carriage to right.
5 As carriage returns to left, helical gear reverses direction, but jaw clutch slips and inking ribbon does not unwind.

77. Inking Ribbon Reversing Operation

a. After the inking ribbon is wound entirely on one printing ribbon spool, the direction of inking ribbon feed must be reversed so as to rewind the inking ribbon on the empty printing ribbon spool. This reversing operation is done automatically by the inking ribbon feed mechanism (fig. 101) when the last turn of inking ribbon is unwound from the paying-out printing ribbon spool.

b. The core of each printing ribbon spool has a cutout, or window, through which the end of the ribbon sensing lever can project (fig. 101). As long as one layer of inking ribbon is wrapped around the core of the printing ribbon spool, the

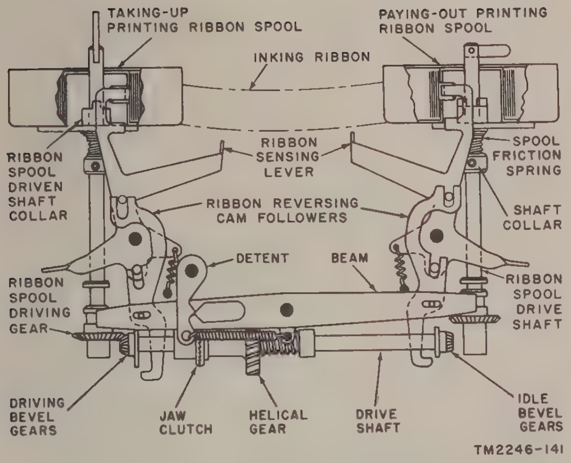


Figure 100. Ribbon feed mechanism.

ribbon sensing lever is retained in position; when the last turn or layer is unwound, the end of the ribbon sensing lever moves through the window. The lower end of the ribbon reversing cam follower, mounted on the ribbon sensing lever, thus is brought into position under the reversing cam on the drive shaft. The lobe of the reversing cam pulls down the ribbon reversing cam follower (which can slide on its mounting pins) within the next one-half revolution of the drive shaft. The downward movement of the ribbon reversing cam follower forces the beam to pivot, disengaging the bevel gears on one end of the drive shaft and engaging those on the other end. The empty printing ribbon spool thus becomes the taking-up printing ribbon spool and, as soon as one layer of ribbon is wound onto it, the ribbon sensing lever is pushed in and the ribbon reversing cam follower moves away from the reversing cam. The detent (fig. 100) keeps the beam latched in the new position. When the last layer of inking ribbon is removed from the supply printing ribbon spool, the whole process is repeated.

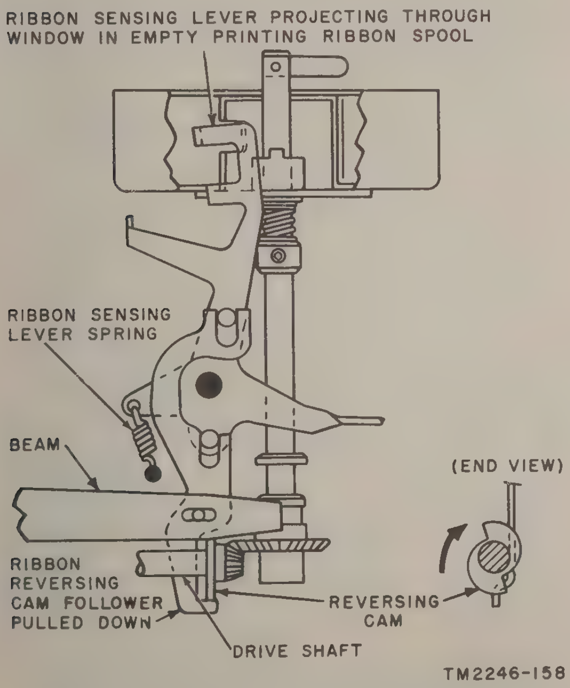

RIBBON SENSING LEVER PROJECTING THROUGH WINDOW IN EMPTY PRINTING RIBBON SPOOL
RIBBON SENSING LEVER SPRING
BEAM
(END VIEW)
RIBBON REVERSING CAM FOLLOWER PULLED DOWN
REVERSING CAM
DRIVE SHAFT
TM2246-158

Figure 101. Inking ribbon reversing mechanism.

c. The following chart lists the inking ribbon reversing operation sequences.

Inking Ribbon Reversing Sequence Chart

1 Starting with left bevel gears meshed and right bevel gears unmeshed, whenever carriage moves to right; left printing ribbon spool is driven, taking up inking ribbon; right printing ribbon spool idles, paying out inking ribbon.
2 Eventually, almost entire inking ribbon is unwound from right printing ribbon spool.
3 Window in printing ribbon spool becomes uncovered.
4 End of ribbon sensing lever projects through window (spring action).
5 Ribbon cam follower moved under reversing cam (which turns when carriage moves to right).
6 Within one-half revolution of cam, ribbon cam follower is pulled down.
7 Beam pivoted clockwise, trips detent, and relatches in clockwise position.
8 Left bevel gears unmeshed.
9 Right bevel gears meshed.
10 Right printing ribbon spool now is driven, taking up inking ribbon, and left printing ribbon spool idles, paying out inking ribbon.
11 Above sequence repeats in opposite direction.

78. Rangefinder Mechanism

a. Teletypewriter signal waveforms become distorted when transmitted because of such line characteristics as inductance and capacitance. A device is provided that permits an adjustment for optimum operation with distorted signals. For a detailed discussion on the nature and effects of distortion, refer to TM 11–680, Teletypewriter Circuits and Equipment (Fundamentals).

b. Distortion consists of rounding the corners and sloping the sides of the waveforms and results in some impulses becoming shortened and others becoming lengthened. This has the effect of shifting some of the later code impulses of a signal with respect to the starting impulse. To permit the selector mechanism to work properly, in spite of these shifts, the selector cams are

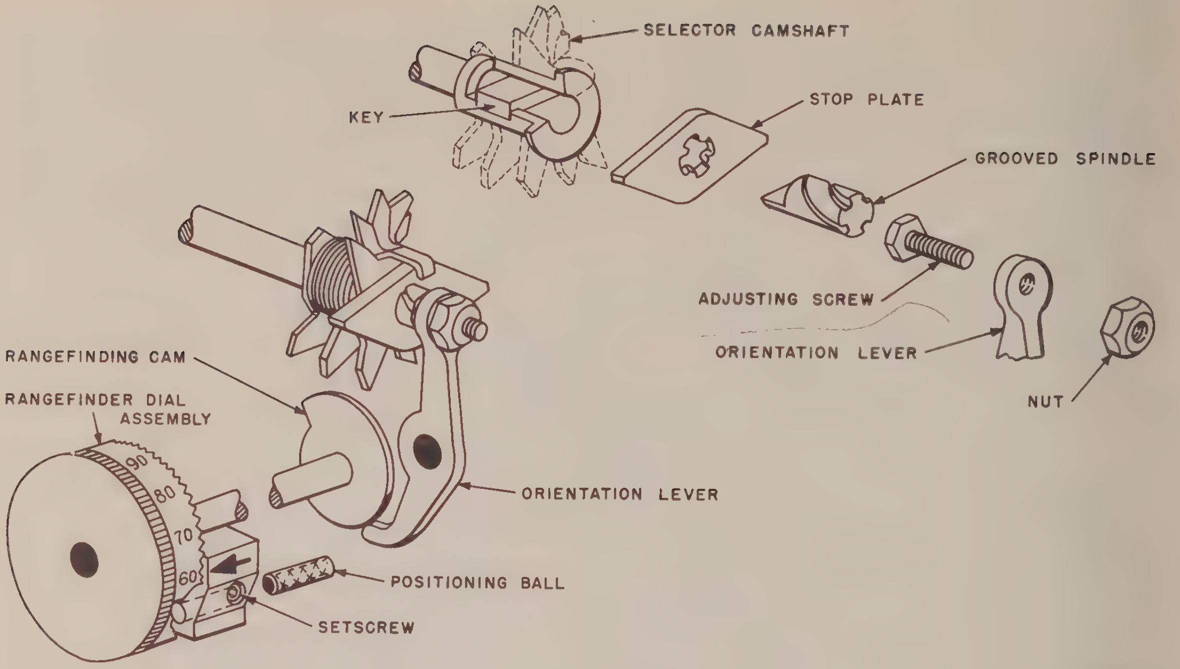


Figure 102. Rangefinder mechanism.

designed so that they operate for only about 5 milliseconds (compared to the full standard code impulse length of 22 milliseconds), and the relationship of the cam operating points with respect to the start impulse is made adjustable.

c. The fact that a selector cam requires only about 20 percent of an impulse length to perform its function makes it possible to shift the selected interval ahead or behind the mid point of the impulse. The cam will operate during the selected interval of the receiving impulse. The relationship between the stop plate and the selector cam is made adjustable to orient the cams within the impulse. The mechanism for making the adjustment is described in *d* below.

d. The timing relationship between the selector cams and stop plate is adjusted by altering the angular position of the stop plate with respect to the selector camshaft (fig. 102). Increasing the angle between the stop plate and the cam lobes causes the selector cams to operate later in the impulse. Decreasing the angle causes the cams to operate earlier. The angular position of the stop plate may be adjusted by preventing the stop plate from rotating while rotating the selector camshaft. When this is done, the grooved spindle on which the stop plate is mounted will move outward. The angular position of the stop plate may be adjusted in the opposite direction by turning the grooved spindle inward.

e. The movement of the orientation lever is controlled by means of rangefinder dial assembly and the rangefinding cam. Turning the rangefinder dial assembly clockwise increases the time between the selector cam operating points and the start impulse. Turning it counterclockwise decreases the time.

79. Margin Signal Bell Operation

a. The margin signal bell rings automatically to warn the sending operator that the end of a line

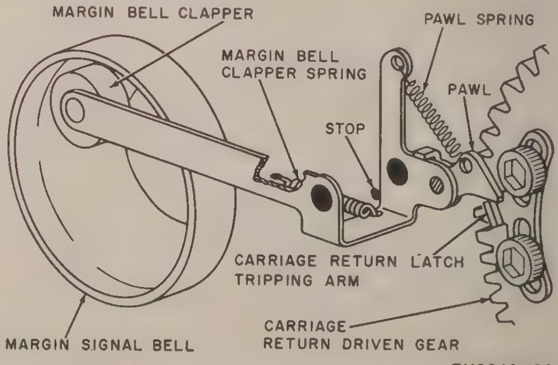

MARGIN BELL CLAPPER
PAWL SPRING
MARGIN BELL CLAPPER SPRING
PAWL
STOP
CARRIAGE RETURN LATCH TRIPPING ARM
MARGIN SIGNAL BELL
CARRIAGE RETURN DRIVEN GEAR
TM2246-106

Figure 103. Margin bell.

is about to be reached. It is operated by the carriage-return latch tripping arm attached to the large carriage-return driven gear (fig. 103), when the carriage approaches the end of its travel.

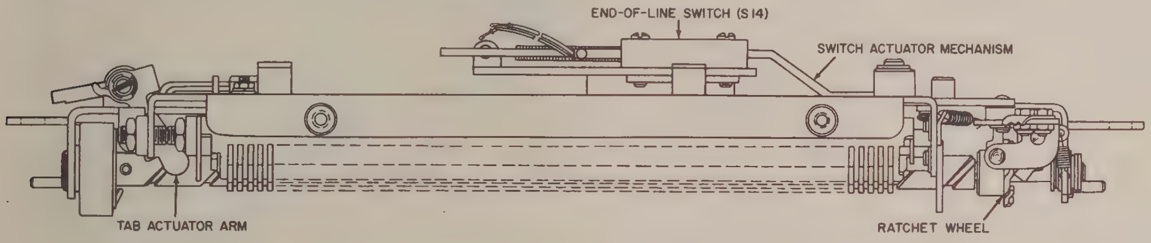
b. As the carriage-return driven gear turns to feed the carriage, the carriage return latch tripping arm lifts the pawl to cause it to pivot downward. When the carriage-return driven gear turns farther, the pawl slips past the carriage-return latch tripping arm and the margin bell clapper snaps back swiftly. The momentum of the margin bell clapper carries it past its stop to strike the upper side of the margin signal bell, ringing the bell. The pawl is pivoted and is held to the margin bell clapper by a pawl spring to permit the carriage-return latch tripping arm to move past the pawl when the carriage-return driven gear comes around for carriage-return.

80. Character Counter and End-of-Line Indicator Mechanism

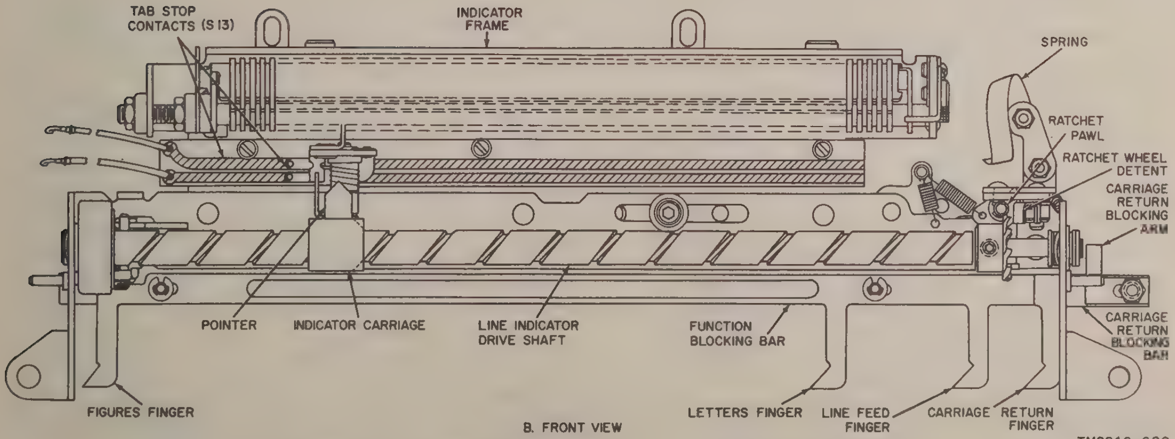
a. A character counting and end-of-line indicating mechanism (fig. 104) is installed on the keyboard. It indicates to the operator the number of characters sent since the last carriage return code group was sent, and warns the operator of the approach of the end of a line so that a proper syllabic word break can be made before the end of the line is reached.

b. The indicator carriage is mounted on the spirally grooved line indicator drive shaft, which is located on the keyboard above the top row of keys. Projections inside the bore of the indicator carriage ride in the spiral groove, and, as the line indicator drive shaft rotates toward the keyboard, the indicator carriage is moved to the right. A pointer mounted on the carriage lines up with an indicator scale on the indicator cover to enable the operator to determine the number of spaces from the left-hand margin that have been spaced since the last carriage-return code group was sent. This is important so that the printed page copy received on the signal line or made from the perforated tape is in the correct form.

c. The line indicator drive shaft is rotated by



A. TOP VIEW



B. FRONT VIEW

TM2246-609

Figure 104. Character counter and end of line indicator mechanism.

a ratchet pawl and ratchet wheel at the right side of the line indicator drive shaft (fig. 105). The ratchet wheel is mounted on the line indicator drive shaft and is driven by the ratchet pawl mounted on the cam follower. As the restoring solenoid (L1) is operated to restore the cam-stop lever, it pivots the stop latch cam against which rides the cam follower. The pivoting of the stop latch cam causes the cam follower to move up and down, moving the ratchet pawl with it. As the ratchet pawl moves upward, it engages a tooth of the ratchet wheel, forcing the ratchet wheel and line indicator drive shaft to rotate. The pawl disengages the tooth of the ratchet wheel on the downward stroke, and causes no movement of the ratchet wheel or line indicator drive shaft. Each time the ratchet wheel is moved a tooth space, the ratchet wheel detent is cammed out of the ratchet wheel tooth and then pulled back into the tooth of the ratchet wheel by the detent spring, preventing any reverse rotation of the line indicator drive shaft (fig. 106). As the line indicator drive shaft rotates toward the front of the keyboard, it winds up the indicator return spring in the indicator return spring housing at the left of the line indicator drive shaft. The indicator return spring stores the power required to return the indicator carriage to the left margin when the carriage-return key lever is depressed. Depression of the carriage-return key lever causes the key lever to hit the extension on the carriage-return blocking bar, shifting it to the right (fig. 106). It is latched in this position by the tab actuator arm. As it shifts to the right, it causes the carriage-return blocking arm to strike the ratchet wheel detent and the ratchet pawl, pivoting them out of engagement with the ratchet wheel. This allows the indicator return spring to unwind, reversing the direction of rotation of the line indicator drive shaft. This causes the indicator carriage to return to the left margin. The indicator carriage moves the tab actuator arm out of engagement with the carriage return latch lever. This unlatches the carriage return blocking bar, allowing it to be moved to the left by the function blocking bar spring to release the ratchet wheel detent and ratchet pawl. The ratchet wheel detent and ratchet pawl are again moved into the path ofthe ratchet wheel, prohibiting any reverse rotation of the line indicator drive shaft.

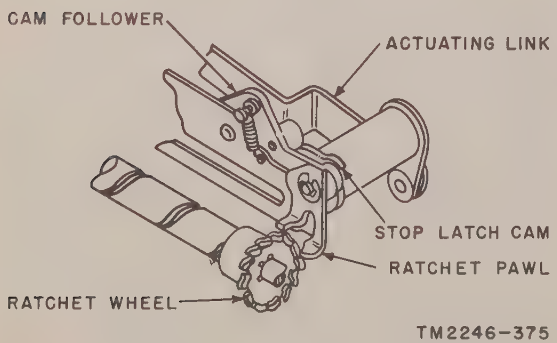


Figure 105. Character counter operation.

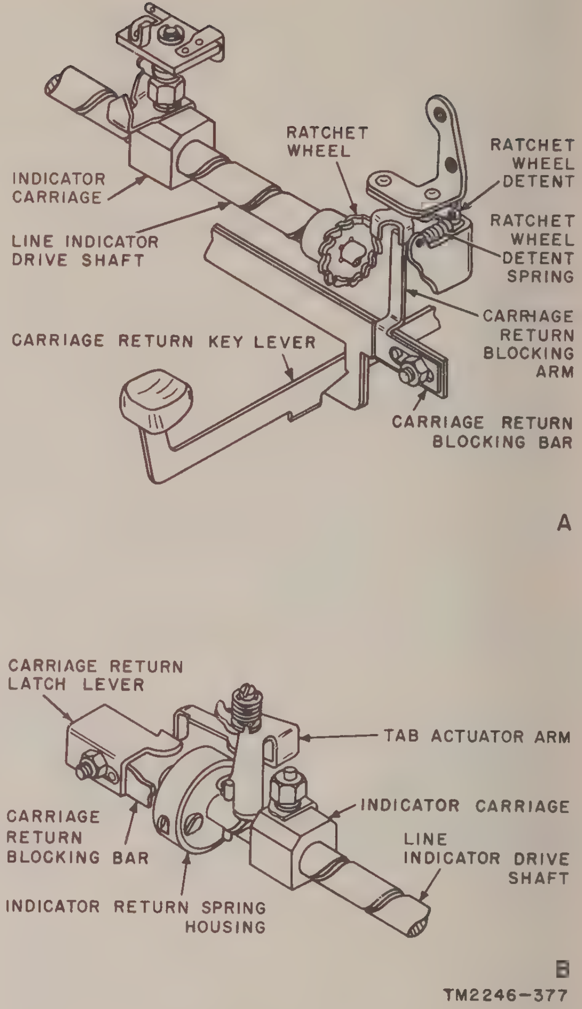

RATCHET WHEEL
RATCHET WHEEL DETENT
INDICATOR CARRIAGE
LINE INDICATOR DRIVE SHAFT
RATCHET WHEEL DETENT SPRING
CARRIAGE RETURN BLOCKING ARM
CARRIAGE RETURN KEY LEVER
CARRIAGE RETURN BLOCKING BAR
A
CARRIAGE RETURN LATCH LEVER
TAB ACTUATOR ARM
INDICATOR CARRIAGE
CARRIAGE RETURN BLOCKING BAR
LINE INDICATOR DRIVE SHAFT
INDICATOR RETURN SPRING HOUSING
B
TM2246-377

Figure 106. Indicator carriage-return mechanism.

d. The end-of-line lamp (I 3) is energized through the end-of-line switch (S14) which is actuated by the indicator carriage. When the indicator carriage moves to the 66th space, the guide roller on the back of the indicator carriage

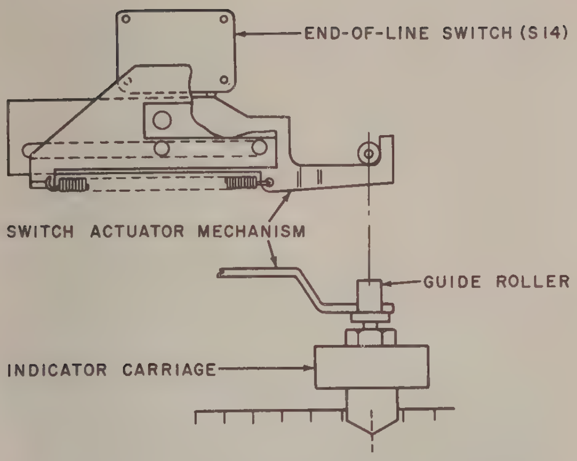


Figure 107. End-of-line lamp switching mechanism.

moves an arm of the switch actuator mechanism to the right. The movement of the switch actuator mechanism operates a plunger at the bottom of the end-of-line switch (S14) (fig. 107) closing the circuit to the end-of-line lamp (I 3). When the carriage-return key lever is depressed, causing the indicator carriage to return to the left margin, the guide roller moves out of contact with the switch actuator mechanism. This allows the switch actuator spring to restore the switch actuator mechanism and open the circuit to the end-of-line lamp (I 3).

e. Figures, letters, and line feed functions do not cause the indicator carriage to move. To prevent the indicator carriage from spacing, a blocking mechanism operates when the key levers for the above functions are depressed. The function blocking bar (fig. 108) mounted on the front of the tabulator frame has three slanting projections, one for each of the nonspacing function key levers. These projections are so spaced that when any one of the nonspacing key levers is depressed, the function blocking bar shifts to the right and moves the ratchet pawl out of engagement with the ratchet wheel.

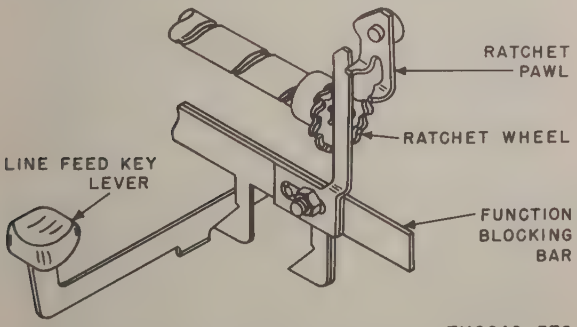


Figure 108. Indicator carriage operation blocked during sending of nonspacing function.

f. A summary of the operation of the character counter and end-of-line indicator mechanism is contained in the chart below.

Character Counter and End-of-Line Indicator Mechanism Sequence Chart

1 Stop-latch cam pivoted by restoring solenoid L1.
2 Stop latch cam moves cam follower up.
3 Cam follower engages the ratchet pawl, moving it upward.
4 Ratchet pawl engages a tooth on the ratchet wheel, rotating ratchet wheel and line indicator drive shaft.
5 Ratchet detent moved out of the path of the ratchet wheel.
6 Rotation of line indicator drive shaft causes indicator carriage to be moved one space.
7 Indicator return spring wound up in indicator spring housing.
8 Ratchet wheel detent spring restores the ratchet wheel detent to prevent reverse rotation of line indicator drive shaft.
9 Operation repeats until 66th line space is reached. At 66th space, guide roller moves the switch actuator mechanism, closing circuit to end-of-line lamp I 3.
10 Carriage-return key lever is depressed, striking extension on carriage-return blocking bar.
11 Carriage-return blocking bar shifts to right.
12 Left end of carriage-return blocking bar latched by tab actuator arm.
Carriage-return blocking arm on right side of carriage-return blocking bar moves ratchet wheel detent and ratchet pawl out of engagement with ratchet wheel.
13 Indicator return spring unwinds, rotating the line indicator drive shaft in a reverse direction and causing the indicator carriage to move to the left of the shaft.
14 As indicator carriage passes the 66th line space on return, the guide roller leaves the switch actuator mechanism, allowing the end-of-line indicator switch S14 to open the circuit of the end-of-line lamp I 3.
15 Indicator carriage strikes the extension on the tab actuator arm, pivoting it clockwise to release the carriage-return latch lever and carriage-return blocking bar, allowing it to move to the left.
16 Carriage-return blocking arm on the carriage-return blocking bar releases ratchet wheel detent and ratchet pawl.

81. Tabulator Operation

a. A tabulator mechanism is installed on the keyboard to aid the operator to indent page copy and put copy in columnar form. The tabulator mechanism makes it possible for messages to be transmitted in tabular form without laborious hand spacing for each column sent.

b. The tabulator mechanism is mounted on the indicator frame. It consists principally of a tab mounting guide and 67 tab set levers. Every fifth tab set lever is red to facilitate the selection of the correct tab set lever. When a desired tab set lever is pulled down the indicator carriage will stop at these spaces. The tabulator locking lever must also be pulled down to allow the tabulator mechanism to function. In the non-operating position (upward) of the tabulator locking lever the tab set levers cannot be engaged by the tab stop contact (S13) on the indicator carriage.

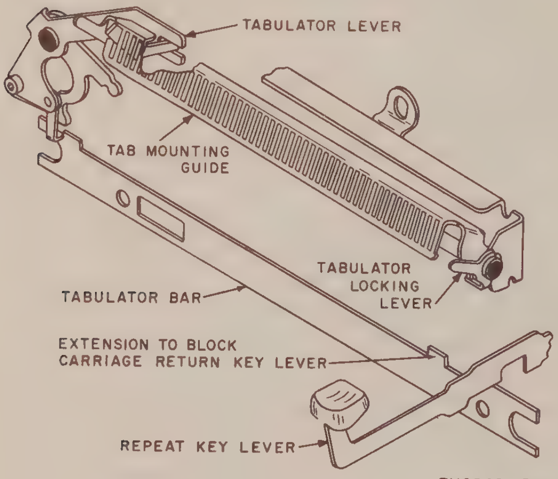


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Figure 109. Tabulator mechanism.

c. Installed in front of the universal bar on the page printer is a tabulator bar. When the repeat key lever is depressed it moves the tabulator bar to the right (fig. 109). When the tabulator bar moves to the right, it causes the tabulator lever to pivot counterclockwise, pivoting the mounting guide forward. When the tabulator locking lever is pulled down and the space bar and repeat key lever are depressed, the tab mounting guide pivots forward so that the preset tab set levers are in line with the tab stop contact (S13) on the indicator carriage. The keyboard continues to send repeated space impulses and the indicator carriage continues to move to the right until the tab stop contact (S13) on the indicator carriage strikes the preset tab set lever (fig. 110). When the tab stop contacts (S13) strike the tab set lever they pivot, forcing the tab stop contacts (S13) on the indicator carriage to press against the tab stop contact (S13) mounted on the indicator frame. This energizes the restoring solenoid (L1), preventing further transmission until the repeat key lever is released. The indicator carriage is now in the position predetermined by the setting of the tab set lever.

d. Releasing the repeat key lever allows the tabulator bar to move to the left. The tabulator lever then pivots clockwise, pivoting with it the tab mounting guide. When the tab mounting guide pivots, it moves the preset tab set lever out of the way of the tab stop contacts (S13) on the indicator carriage. The tab stop contacts (S13) on the indicator carriage are restored to their normal position by the tab stop contact spring. This moves the tab stop contacts (S13) on the indicator carriage away from the tab stop contacts (S13) on the frame deenergizing the restoring solenoid (L1). The indicator carriage is now alined with the position of the preset tab set lever.

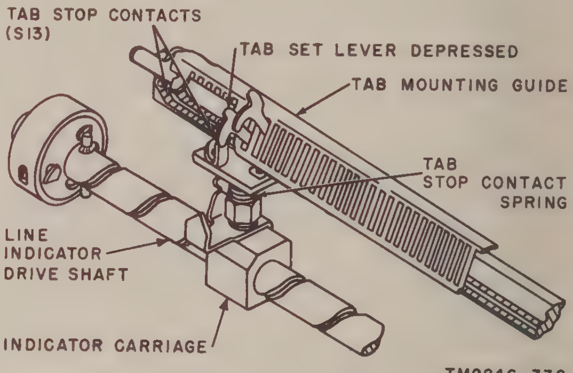

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Figure 110. Indicator carriage pivoted after striking preset tab set lever.

e. Whenever the tabulator bar has been moved to the right, the extension on the tabulator bar blocks the carriage return key lever and prevents operation of the carriage return function until the repeat key lever is released.

f. The operation of the tabulator mechanism is summarized in the following sequence chart.

Tabulator Sequence Chart

Note. The following sequence of operations occurs only when tab set levers and the tabulator locking lever are pulled down.

1 Space bar and the repeat key lever are depressed.
2 Tabulator bar shifts to the right.
3 Tabulator lever pivots counterclockwise, pivoting the tab mounting guide with it.
4 Repeated space code impulses are transmitted, moving the indicator carriage to the right.

5 Tab stop contacts (S13) on indicator carriage strike the preset tab set lever, causing the tab stop contact (S13) to pivot in a clockwise direction.

6 Tab stop contacts (S13) on the indicator carriage contact the tab stop contacts (S13) on the indicator frame energizing the restoring solenoid (L1).

7 Restoring solenoid (L1) pivots stop latch cam to move the cam stop lever upward, blocking further transmission.

8 Repeat key lever released, allowing the tabulator bar to move to the left.

9 Tabulator lever pivots clockwise, pivoting the tab mounting guide with it toward the rear.

10 Preset tab set levers on the tab mounting guide move out of way of tab stop contacts (S13) on indicator, allowing tab stop contacts (S13) to open.

11 Keyboard again ready to send, with indicator carriage spaced to the predetermined position.

Section III. MECHANICAL THEORY OF THE PERFORATOR

82. General

a. Reperforator-Transmitter TT–178/FG and TT–179/FG consist of a transmitter-distributor and a perforator. They are mounted together, with the motor of the perforator providing the power for the transmitter-distributor. Although they are powered by the same motor, each unit is capable of operating independently if that type of operation is desired.

b. The transmitter-distributor is capable of transmitting only standard sequential 5-unit start-stop code. The perforator is capable of receiving standard sequential 5-unit start-stop code in the polar selector magnet and simultaneous code groups in the receiving multisolenoid.

83. Sequential Signaling Code

a. The sequential signaling code sent from the transmitter-distributor and received through the sequential receiving mechanism of the perforator is standard start-stop, 5-unit, teletypewriter code consisting of five equal length marking or spacing impulses, a stop impulse which is 1.42 times longer than a marking impulse.

b. A complete description of the signaling code is found in paragraphs 46 and 47.

84. Basic Principle of Sequential Operation

a. The basic principle of sequential teletypewriter transmission from the transmitter-distributor is the transformation of a mechanical or position relationship into an electrical and time relationship. The basic principle of teletypewriter reception by the perforator is the transformation of an electrical and time relationship into a mechanical relationship. At the transmitter-distributor, the mechanical relation is set up by positioning five sensing levers in response to the perforations in a code tape. At the perforator, a corresponding code ring must be positioned to a mark or a space position in response to the received code impulse.

b. The time sequence of the code impulse is formed when the five electrical impulses representing the character are transmitted in succession from the transmitter-distributor. The electrical form of this 5-unit code is composed of five elements of marking or spacing impulses. In the transmitter-distributor, the mechanical form of the code is composed of sensing levers which are positioned in either a marking or a spacing setting in response to perforated code tape. These sensing levers, aided by other linkages and a power drive, convert the mechanical form of the code into transmitted electrical form.

c. The first sensing lever of the transmitter-distributor controls the transmission of the first electrical code impulse, the second sensing lever controls the transmission of the second electrical code impulse, and so on for the five code impulses.

85. Synchronism

a. Starting and stopping the receiving mechanism in synchronism with the sending mechanism is accomplished by transmitting two additional impulses with the 5-unit code impulse for each character. The start impulse is a spacing impulse sent immediately preceding the 5-unit code impulses (fig. 54). The stop impulse is a marking impulse sent immediately following the 5-unit code impulses. This start impulse causes the receiving mechanism to start operating when a sending mechanism starts. The stop impulse causes the receiving mechanism to stop as the sending mechanism stops.

b. For a more complete description of the synchronizing of the sending units, see paragraph 48.

86. Motors

Transmitting and receiving mechanisms of the perforator are driven by an electric motor mounted in a vertical position at the right-hand side of the machine. Reperforator-Transmitter TT–179/FG is powered by a synchronous motor and Reperforator-Transmitter TT–178/FG is powered by a series-governed motor.

a. Synchronous Motor (fig. 209). The synchronous motor used in Reperforator-Transmitter TT–179/FG is used with signle-phase, 115 volts of alternating current at a frequency of 60 cycles. This type motor is 1/20 horsepower, 3,600 rpm, with a squirrel cage type motor armature. Its stator has a main running winding and an auxiliary starting winding. Its circuit is the same as the circuit shown in figure 146, except that when a predetermined current value is reached, the armature of the start relay (E8) is released, the relay contacts open, and the starting winding circuit remains complete through C11B rather than through C9B as on the page printer.

b. Series-Governed Motor (fig. 210). The series-governed motor in Reperforator-Transmitter TT–178/FG operates on 105 to 125 volts regulated or unregulated ac and is governed to run at 3,600 rpm. The armature and field coils are in series with the contacts of the motor governor assembly MOTOR switch (S22), and an overload protection fuse (F5). The copy lamp (I 4) is across the motor circuit. The governor contacts are normally closed, but open when the motor speed increases above the allowable maximum. This places a resistor (R12) in series with the motor, causing its speed to drop. When the proper speed is reached, the governor contacts close again. Resistor R12 in combination with capacitor C10 also acts as a spark suppressor for the governor contacts. The coils and capacitors in the motor filter (Z8) are provided to suppress radio frequencies generated by the governor contacts and the motor commutator. Elimination of these frequencies minimizes interference with the operation of associated electronic equipment.

87. Governor

The motor governor on the series-governed motor is adjustable to permit the motor speed to be maintained at precisely 3,600 rpm. Its operation is described in paragraph 50.

88. Power Distribution

The mechanisms of the perforator are driven through gears on the mainshaft (fig. 111) which is rotated by the motor. These gears turn the clutch disk and key clutch disk of the friction

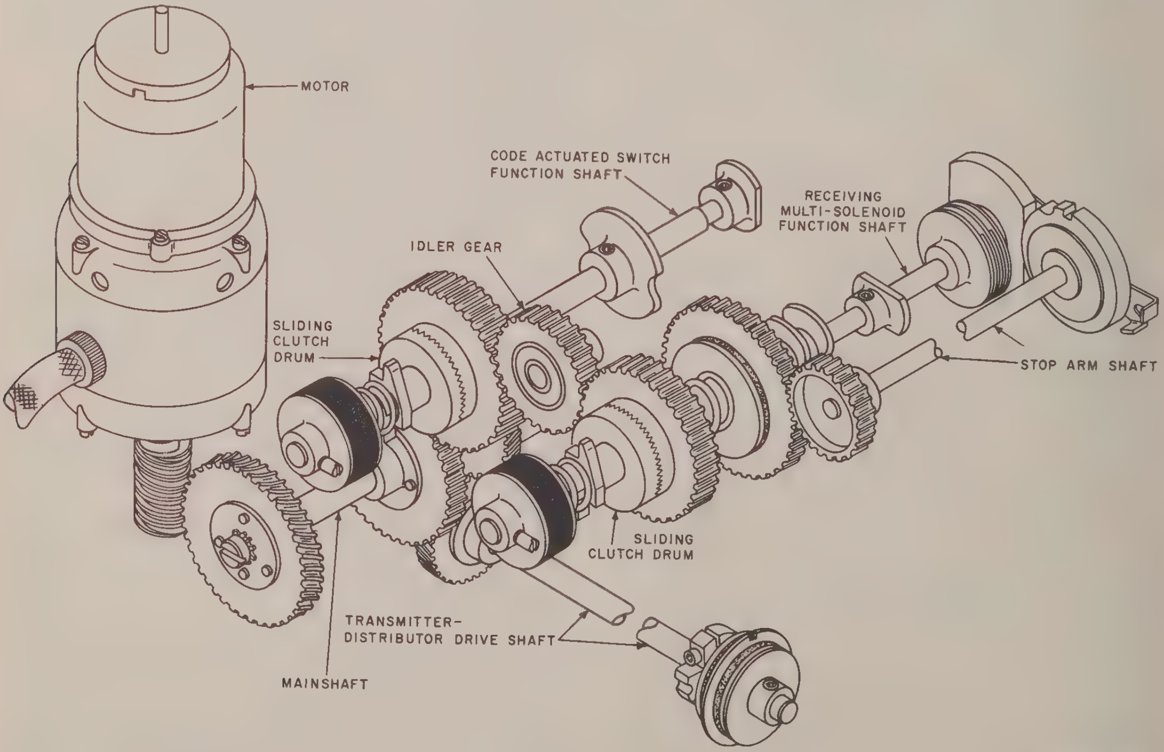

MOTOR
CODE ACTUATED SWITCH FUNCTION SHAFT
RECEIVING MULTI-SOLENOID FUNCTION SHAFT
IDLER GEAR
SLIDING CLUTCH DRUM
STOP ARM SHAFT
SLIDING CLUTCH DRUM
TRANSMITTER-DISTRIBUTOR DRIVE SHAFT
MAINSHAFT
TM2246-380

Figure 111. Mechanical power distribution arrangement with standard 368.1-opm driving gears in use.

clutch on the transmitter-distributor drive shaft, as well as powering the function shafts and the other mechanisms of the perforator. The speeds of rotation shown for the various parts in figure 111 are those that occur at standard 368.1 opm. When the accessory 460-opm or 600-opm driving gears are used, the speeds of the shafts are proportionately higher although the motor speed remains constant.

89. Transmitter-Distributor Driving Mechanism

a. The motor continuously rotates the transmitter-distributor driving shaft, which is coupled to the transmitter-distributor by a friction clutch (fig. 57). The transmission of each code group from a transmitter-distributor requires one-half revolution of the transmitter camshaft.

b. The friction clutch is made up of a driving and driven portion. The driving portion of the clutch consists of a keyed clutch disk, a clutch driver, a clutch disk, two felt plates, a friction clutch spring, and a keyed collar. The driven portion consists of the friction clutch fork mounted on the transmitter camshaft (fig. 112).

c. The friction clutch fork on the transmitter camshaft engages the notches of the center clutch driver. Two felt plates on the transmitter-distributor drive shaft are held tightly against the clutch driver by the pressure of the friction clutch spring. The friction between the clutch driver and the felt plates rotated by the outer clutch disks attached to the transmitter-distributor drive shaft is sufficient to rotate the transmitter camshaft during transmission of each code group (magnet energized, B, fig. 113). If the driven transmitter camshaft is mechanically halted (magnet deenergized, A, fig. 113), the friction between the clutch driver and the outer clutch disks is overcome and the clutch driver remains stationary between the two felt plates. When the magnet is again energized, releasing the camshaft stop lever which engages the stop lever on the transmitter camshaft, the transmitter camshaft resumes rotation.

90. Transmission Control

The starting and stopping of the transmitter camshaft is controlled by a clutch magnet (E7), clutch magnet armature, camshaft stop lever, and a stop lever cam that is part of the transmitter camshaft.

a. When the transmitter-distributor is idle, the clutch magnet is deenergized. Rotation of the transmitter camshaft is prevented because the upper end of the camshaft stop lever (A, fig. 113) contacts the blocking end of the magnet armature, and the center projection of the stop lever contacts

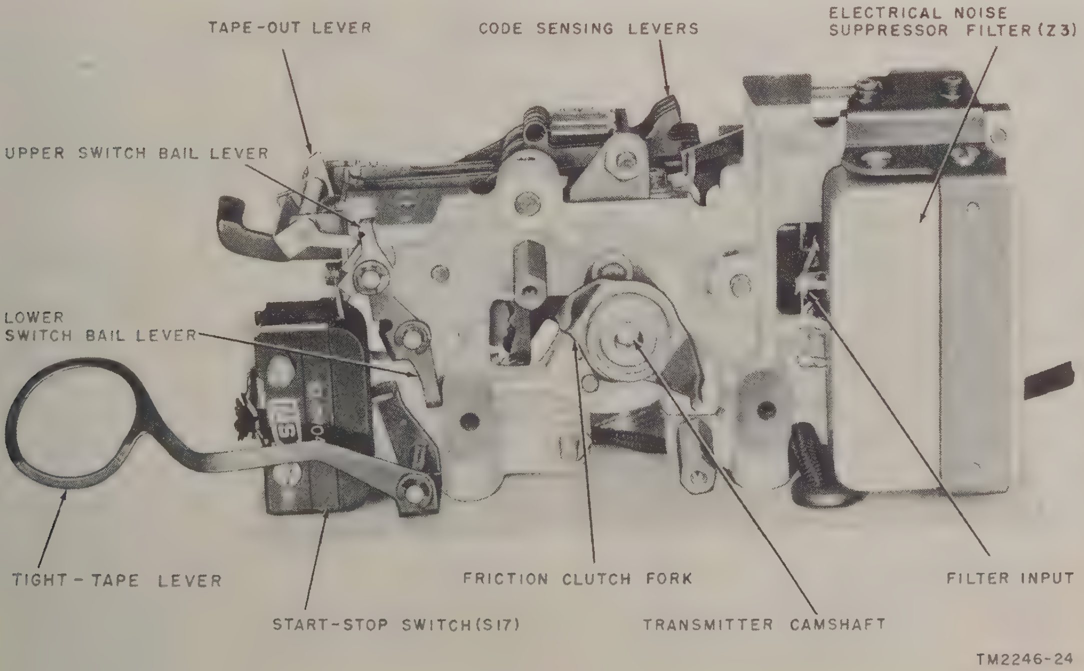


Figure 112. Right side view of the transmitter-distributor, showing switch control mechanism.

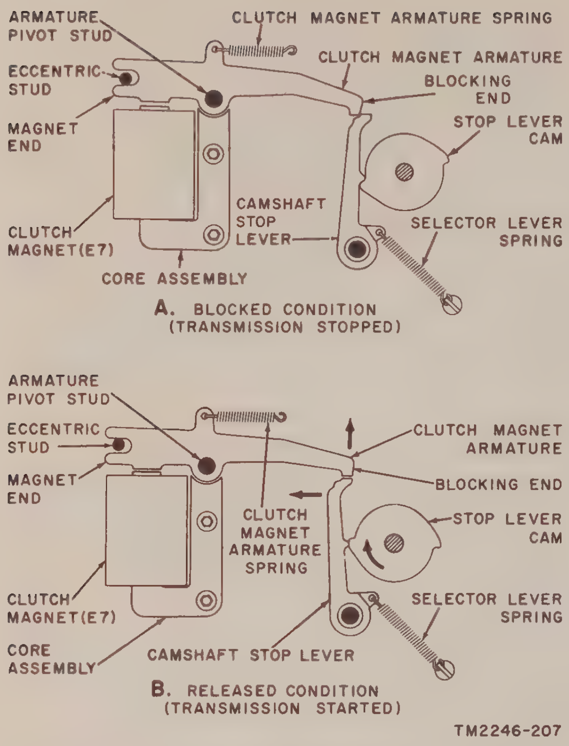


Figure 113. Transmitter camshaft control mechanism.

a lobe on the stop lever cam. This holds the transmitter camshaft stationary against the drive of the friction clutch.

b. When the STOP-START lever is placed in the START position, a mechanical train of parts causes the start-stop switch (S17) to close the circuit through the clutch magnet (E7). This permits the clutch magnet (B, fig. 113) to energize and attract the magnet end of the clutch magnet armature. When the clutch magnet (E7) becomes energized, the blocking end of the armature will move out of the path of the camshaft stop lever. The stop lever cam, driven by the friction clutch, rotates past the blocking projection on the camshaft stop lever.

c. The train of parts that operates the start-stop switch (S17) in the clutch magnet (E7) circuit is controlled by:

(1) Upward movement of the tight-tape lever.
(2) Upward movement of the sensing portion of the tape-out lever.
(3) Manual movement of the STOP-START lever to either the STOP or RETRACT position.

91. Tape Sensing

a. The tape sensing mechanism (fig. 114) consists of five identically shaped code sensing levers, five code sensing lever springs, a sensing lever restoring bail, and a sensing lever restoring cam that is part of the transmitter camshaft.

b. When the transmitter-distributor is idle, the pin ends of the five code sensing levers are held down by the sensing lever restoring bail and the sensing lever restoring cam, and the tops of all the pins are below the surface on which the message tape rests. As the transmitter camshaft comes to rest, the high part of the sensing lever restoring cam moves against the sensing lever restoring bail, rotating the sensing lever restoring bail clockwise slightly. The front arm of the sensing lever restoring bail, which is in contact with the center arm of all the code sensing levers, causes the code sensing levers to rotate clockwise, moving the pins below the surface of the message tape.

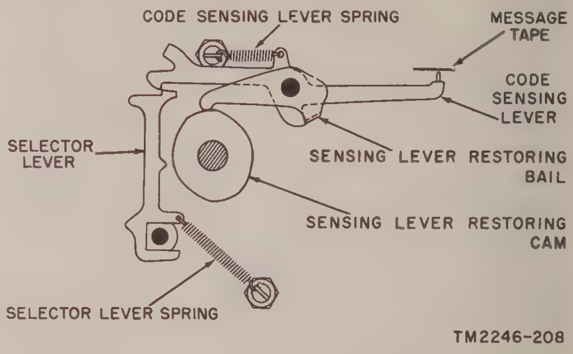

CODE SENSING LEVER SPRING
MESSAGE TAPE
CODE SENSING LEVER
SELECTOR LEVER
SENSING LEVER RESTORING BAIL
SENSING LEVER RESTORING CAM
SELECTOR LEVER SPRING
TM2246-208

Figure 114. Tape sensing mechanism.

c. When a message is to be transmitted, a perforated message tape must be placed in the transmitter-distributor. The driving and transmission control mechanisms, described in paragraphs 89 and 90, cause the transmitter camshaft to rotate. As the cams on the transmitter camshaft rotate, the rear arm of the sensing lever restoring bail moves to the low part of the sensing lever restoring cam. The code sensing lever springs provide the tension to cause the pin ends of all the code sensing levers to move upward against the message tape (fig. 115). In this way, the code sensing levers are positioned to correspond with the code perforations in the message tape. If a code hole is present above any particular code sensing lever, the pin moves upward, through the code hole, and the code sensing lever is positioned

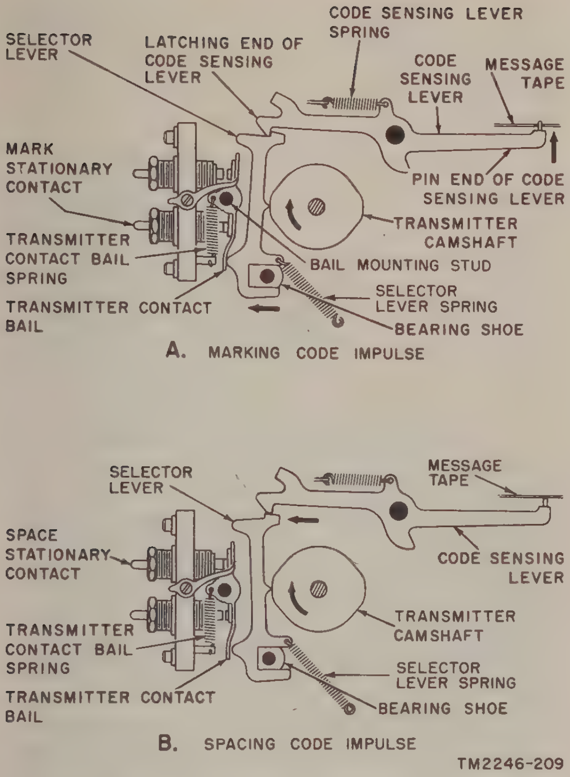


Figure 115. Transmitting of marking and spacing impulses.

to transmit a marking impulse (A, fig. 115). If no code hole is present, the message tape halts upward movement of the code sensing lever, holding it in the spacing impulse position (B, fig. 115).

92. Impulse Transmission

a. A marking code impulse is transmitted in the following manner: if a hole is present in the message tape directly above the pin end of a code sensing lever, during the tape sensing operation the pin continues to move upward through the hole in the message tape (A, fig. 115), and the latching end of the code sensing lever latches its mating selector lever. When a lobe of the associated cam moves against the center projection of the selector lever, the selector lever, now latched at its upper end, slides on its bearing shor (lower end), closing the contacts of the transmitter contact bail (E6) and the mark stationary contact (E6). If a spacing code impulse is to be transmitted, no hole is present in the message tape directly above the pin end of a code sensing lever (B, fig. 115). The lever rotates counterclockwise until the upward movement of the pin is blocked by the tape. This slight counterclockwise rotation of the code sensing lever is not enough to cause the latching end to latch a selector lever. When the lobe of the associated selector lever cam moves against the center projection of the selector lever, it pivots on its bearing shoe. The upper end moves counterclockwise, permitting the transmitter contact bail spring to open the contact of the transmitter contacts contact bail and the mark stationary contact transmitting a code impulse.

b. The start and stop impulses are transmitted as described below. The transmitter camshaft starts turning when the clutch magnet (E7) is energized and stops when the clutch magnet (E7) is deenergized.

(1) When the transmitter camshaft is in its stopped position, the lobe on the start-stop cam is opposite the midpoint of the start-stop selector lever (A, fig. 116). The start-stop selector lever, permanently held at its upper end by the stop selector lever latch, slides on its bearing shoe. The lower part of the start-stop selector lever closes the transmitter contact bail against the mark stationary contact, sending the stop impulse (mark) to the

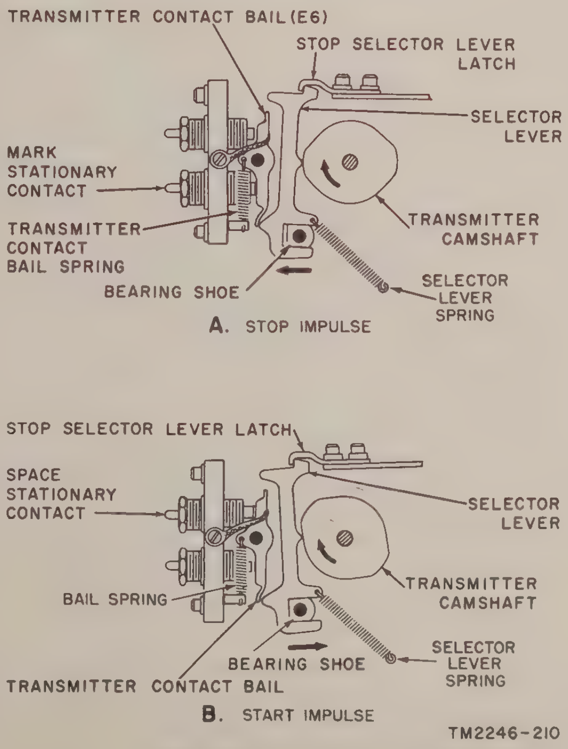
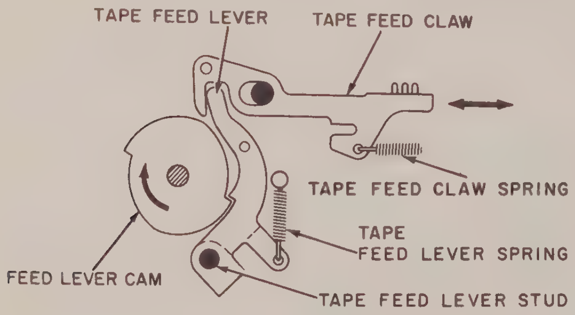


Figure 116. Transmission of start and stop impulses.

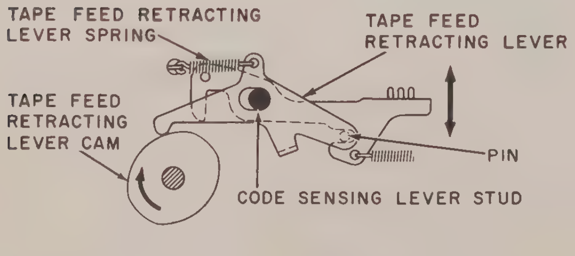
signal line. This occurs each time the lobe on the start-stop cam pushes the midpoint of the start-stop selector lever toward the transmitter contact bail.

(2) When a code group is to be transmitted, the transmitter camshaft is permitted to rotate, and the first impulse transmitted is the start impulse (B, fig. 116). As the transmitter camshaft starts turning, the lobe on the start-stop cam moves away from the midpoint of the start-stop selector lever. The lower end of the start-stop selector lever then moves to the right because of the pull of the selector lever spring. The transmitter contact bail spring is then permitted to move the transmitter contact bail causing the transmitter contact bail to move away from the mark stationary contact, sending the start impulse (spacing) to the signal line.

c. Each code sensing lever controls only its associated selector lever. Any selector lever, however, will actuate the transmitter contact bail when that selector lever is moved by its cam.



A. HORIZONTAL MOVEMENT



B. VERTICAL MOVEMENT

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Figure 117. Tape feed mechanism.

The five cams are angularly displaced so that they operate their associated selector levers in sequence as the transmitter camshaft rotates.

93. Tape Feed

Tape feed occurs immediately after the transmission of each code group. The tape feed mechanism (fig. 117) consists of a tape feed claw, a tape feed lever and feed lever cam, a tape feed retracting lever and tape feed retracting lever cam, and associated springs. The tape feed mechanism accomplishes tape feeding in two distinct movements: a horizontal movement (motion of the tape feed claw from left to right and back again), and a vertical movement (raising and lowering of the tape feed claw).

a. At the beginning of transmission of a code group, the transmitter camshaft is released by the clutch magnet armature and the feed lever cam rotates in a clockwise direction. The tape feed lever (A, fig. 117) is held against the cam by the tape feed lever spring, and the upper end of the tape feed lever engages a notch in the tape feed claw. As the high portion of the feed lever cam approaches the projection on the tape feed lever, the tape feed claw is moved horizontally from left to right by the tension provided by the tape feed claw spring. When the feed lever cam rotates enough to allow the stronger tape feed lever spring to pull the tape feed lever into the notch in the feed lever cam, the tape feed claw moves abruptly from right to left. The combined action of this assembly moves the tape feed claw horizontally from left to right and back again. Tape is fed on the return movement.

b. In addition to the horizontal movement described above, the tape feed claw is also moved vertically by the tape feed retracting lever and the tape feed retracting lever cam (B, fig. 117). A pin through the right arm of the tape feed retracting lever extends horizontally through a notch in the tape feed claw. This pin causes the tape feed claw to follow the movement of the right end of the tape feed retracting lever. When the transmitter is idle, the tape feed retracting lever rests against the low part of the tape feed retracting lever cam and the tape feed claw is in the upper position. At the beginning of transmission of a code group, the tape feed retracting lever cam rotates. The right end of the tape feed retracting lever moves downward, carrying the tape feed claw with it. As the tape feed retracting lever cam completes one-half revolution, the tape feed retracting lever spring causes the tape feed retracting lever to return to the upper position. The combined action of the tape feed retracting lever and tape feed retracting lever cam for this operation is to move the tape feed claw vertically—upward to engage the tape before feeding and downward after feeding.

c. The actual motion of the tape feed claw under control of the tape feed lever, tape feed retracting lever and their respective cams is rectangular. The tape feed retracting lever causes the tape feed claw to engage the tape and withdraw after feeding, and the tape feed lever moves the tape feed claw back and forth to feed the tape a distance of one space.

94. Transmitter-Distributor Operation Sequence Chart

Following is a chart describing the sequence of operations for the transmitter-distributor. It is assumed that the message tape is properly installed in the transmitter-distributor.

95. Receiving Sequential Code Impulses by Perforator

The polar selector magnet used to receive sequential code impulses is identical to the polar selector magnet used on the page printer and described in paragraph 60. The polar selector magnet is mounted on the perforator with the magnetic coils in a horizontal position, while on the page printer it is mounted in a nearly vertical position. However, its operation is the same in both cases, see paragraph 60 for a description of the operation of the polar selector magnet.

Transmitter-Distributor Operation Sequence Chart

1	**Stop-start** lever moved to the START position.	
2	Clutch magnet (E7) energized, energizing the core assembly.	
3	Clutch magnet armature pivoted counterclockwise by clutch magnet (E7), releasing camshaft stop lever.	
4	Camshaft stop lever pivots counterclockwise, freeing stop lever cam.	
5	Friction clutch operates.	Transmitter camshaft starts rotating.
6	Sensing lever restoring bail moves into low part of sensing lever restoring cam, code sensing levers raise.	
7	Code sensing levers strike message tape.	If code sensing lever is aligned with hole in tape (marking), it latches selector lever. If code sensing lever is aligned with no hole in tape (spacing), it does not latch selector lever.
8	Start-stop cam allows selector lever spring to pull start-stop selector lever counterclockwise.	
9	Start-stop selector lever pivots transmitter contact bail to spacing position.	Start (no current) impulse sent.
10	Transmitter camshaft causes No. 1 selector lever to pivot at top if latched (marking) or at the bottom if not latched (spacing).	Transmitter contact bail moved to marking or spacing position sending No. 1 marking or spacing impulse.
11	Tape feed claw moves out of engagement with tape feed holes.	
12	Second, third, and fourth code impulses sent.	Tape feed claw moves forward.
13	Fifth code impulse sent.	Feed claw rises to engage with feed holes.
14	Stop impulse sent.	Code sensing levers lowered by cam action out of way of message tape.
15	Tape feed lever moves to low part of cam, allowing tape feed lever spring to pull tape feed lever to the rear, moving the message tape one space.	
16	Transmitter-distributor ready to transmit another code group.	

96. Transfer Operation

The five code plates (fig. 118) of the code actuated switch must be positioned according to the incoming code group in order to convert the sequential form of the code group to a simultaneous form of the code group which can be received by the receiving multisolenoid for subsequent conversion to printed and punched tape. The incoming code group is stored in the five Y-levers in clockwise and counterclockwise settings in accordance with the marking and spacing impulses of the code group. The Y-lever settings are transferred to the code plates, positioning the code plates.

a. The five code plates can be moved up or down in the code actuated switch. Each code plate has a slot which mates with a corresponding tail of one of the five T-levers (fig. 118). These T-levers are mounted on a common pivot on the end of the transfer lever. Turning the T-lever causes its mating code plate to move up or down. The T-levers are mounted in the same planes as their corresponding Y-levers, and the motion of the transfer lever engages the ends of the T-levers with the ends of the Y-levers. The ends of the T-levers are farther apart than those of the Y-levers, therefore, only one end of the T-lever can engage the Y-lever at any time. When the transfer operation takes place, the transfer lever moves all of the T-levers against the Y-levers; this transfers the five settings of the Y-levers to the T-levers and to the code plates. Each Y-lever set clockwise (the marking position) engages its T-lever at the top. This causes the corresponding code plate to move downward if it is not already in that position. Each Y-lever set counterclockwise (the spacing position) engages its corresponding T-lever at the bottom. This causes the corresponding code plate to move upward if it is not already in that position.

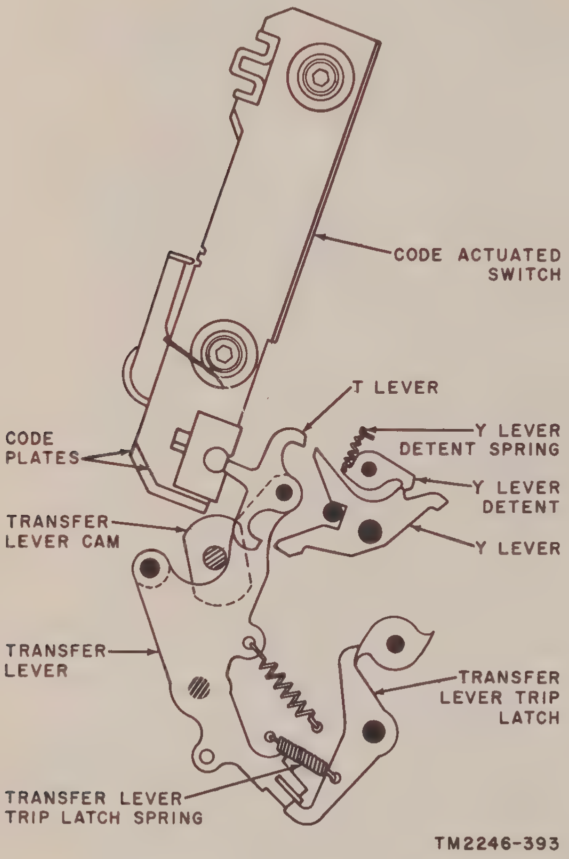


Figure 118. Transfer mechanism.

b. The transfer operation, or turning of the transfer lever, takes place after the fifth code impulse is stored in the Y-levers, but before the selector camshaft is brought to rest by the stop signal. A sixth, or latch-tripping cam mounted on the selector camshaft (fig. 119) trips the transfer lever trip latch that holds the transfer lever in a counterclockwise position, and the transfer lever is pulled clockwise by the transfer lever spring. The timing of the latch-tripping cam with respect to the five selector cams and stop plate is such that the tripping action takes place only after the selecting operation is completed and before the selector camshaft is stopped.

c. Each of the five code plates has a contact wiper (fig. 119) which rides in a notch in the upper portion of the printed commutator. These contact wipers are held against the printed commutator by spring tension. As the code plates move up and down, the contact wipers move with them, each of them closing one circuit in the upper position and a different circuit in the lower position.

d. The printed commutator (fig. 119) has two strips which provide the common contacts of the circuit. One arm of the contact wiper always contacts one or the other of these common strips when positioned in either the spacing or the marking position. In the spacing position (code plate up), the lower arm of the contact wiper contacts the lower strip. In the marking position (code plate down), the upper arm contacts the upper strip. The printed commutator also provides two more contact points for each contact wiper, one above the upper common strip and one below the lower common strip. Thus, when a code plate is in the upper position (spacing), the lower arm of the contact wiper rides against the lower common strip while the upper arm rides against the upper contact, closing one circuit to the receiving multisolenoid. In the same manner, when a code plate is in the lower position (marking), the upper arm of the contact wiper rides against the upper common strip while the lower arm rides against the lower contact, closing a different circuit to the receiving multisolenoid. In this way, each code plate closes one circuit if the impulse it represents is a marking impulse and closes a different circuit if the impulse it represents is a spacing impulse.

e. The operations described in *a* through *d* above are summarized in the following sequence chart.

Transfer Operation Sequence Chart

1 Transfer lever latch tripping cam turns transfer lever trip latch.
2 Transfer lever trip latch releases transfer lever.

Note. The action described in the transfer restoring lever sequence chart (par. 97*a*) begins at this point in the sequence of operations.

3 Transfer lever moves five T-levers against the Y-levers.
4 Y-levers position T-levers.
5 T-levers position code plate.
6 Contact wiper on each code plate closes one circuit for marking and a different circuit for spacing.

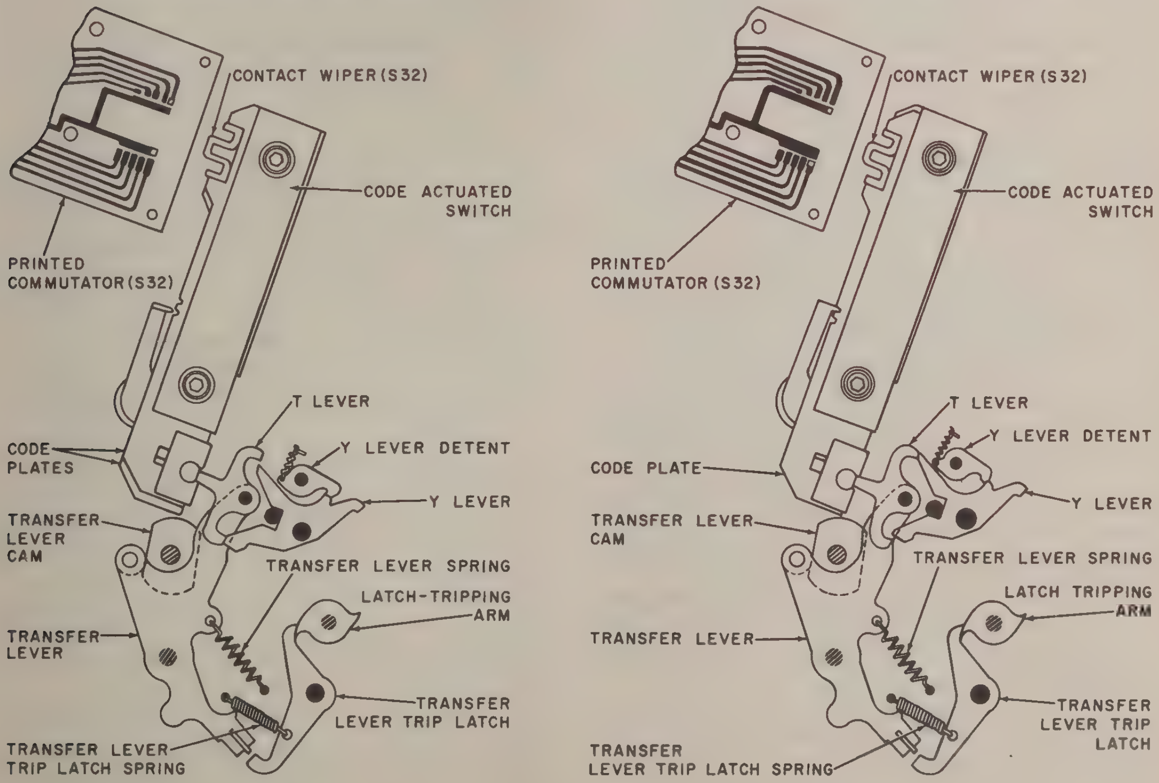
97. Code Actuated Switch Function Shaft Operation

The code actuated switch function shaft restores the transfer mechanism to its latched position, provides the power to register and lock the code plates in place, and controls the receiving multi-solenoid pulsing contacts (S18), which energize the circuits of the receiving multisolenoid. These operations are described in detail in *a* through *c* below.

a. Restoring Transfer Mechanism.

(1) The T-levers must be moved away from the Y-levers before the next code group can be set up in the Y-levers. This action is accomplished when the transfer lever is restored to the latched position. The transfer lever must be rotated slightly counterclockwise against the tension of the transfer lever spring and latched in this counterclockwise position by the transfer lever trip latch (fig. 119). The transfer lever cam, mounted on the front of the code actuated switch function shaft, accomplishes this action when the code actuated switch function shaft completes its one-half revolution.

(2) The code actuated switch function shaft starts turning as a result of the transfer operation. When the transfer lever moves the T-levers against the Y-levers, partial rotation of the transfer lever causes the clutch latch arm to rotate also, since both are attached to the same shaft. The clutch latch arm moves away from an arm of the sliding clutch drum on the function shaft, permitting the teeth on the sliding clutch drum to engage (fig. 111). When the code actuator switch function shaft revolves, the transfer lever cam (fig. 119) moves the transfer lever toward the restored position. Near the end of the one-half revolution, the transfer lever trip latch spring pulls the transfer lever trip latch into position to latch the transfer lever.



A. SPACING

B. MARKING

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Figure 119. Selector bars positioning switch contact wipers on printed circuit.

(3) The operations described in (1) and (2) above are summarized in the following sequence chart.

Restoring Transfer Lever Sequence Chart

1 Transfer lever trip latch releases transfer lever.
2 Transfer lever, shaft, and clutch latch arm turn.
3 Clutch latch arm releases sliding clutch drum.
4 Sliding clutch drum engages.

Note. The actions described in the Code Plate Registering Sequence Chart begin at this point in the sequence of operations.

5 Code actuated switch function shaft starts turning.
6 Transfer lever cam lifts transfer lever.
7 T-levers move clear of Y-levers, and clutch latch arm returns to position.
8 Transfer lever latched.
9 Arms of sliding clutch drum meets clutch latch arm ball bearing.
10 Sliding clutch drum disengaged.
11 Clutch latch arm holds sliding clutch drum.
12 Code actuated function shaft stops at completion of ½ revolution.

b. Registering and Locking Code Plate.

(1) After the five code impulses have caused the positioning of the five code plates of the code actuated switch, the five code plates are registered and locked in place to align the contact wipers in the exactly correct position and to prevent the code plates from shifting out of alignment. This is accomplished by the interoperation of a code actuated switch cam on the code actuated switch function shaft, a code actuated switch cam follower, and a register arm (fig. 120).

(2) While the selection and transfer operation is taking place, the code actuated switch cam follower rests in the indent of the code actuated switch cam on the code actuated switch function shaft. The code actuated switch function shaft is latched up during this time and neither the code actuated switch function shaft nor the code actuated switch cam rotates. When the code actuated switch function shaft is unlatched and starts to rotate, as described in *a* above, the code actuated switch cam follower moves to the high part of the code actuated switch cam and is pivoted on the register arm shaft which is an integral part of the register arm. The code actuated switch cam follower pivots the register arm shaft and the register arm through a spring connection between the register lever, which is secured to the register arm shaft and the code actuated switch cam follower.

(3) When the register arm is pivoted, a blade on the end of the arm meshes with the notches in the code plates. These notches are alined, with the upper notches of the marking positioned code plates in line with the lower notches of the spacing positioned code plates, so that the five code plates can be simultaneously engaged by the blade of the register arm. Since the notches are V-shaped, and the blade has a knife edge, slightly out-of-line code plates are cammed into place as the register arm engages the notches.

(4) During the positioning interval, the code actuated switch cam follower rests in an indent of the code actuated switch cam, allowing the code plates to move. During the remainder of the code actuated switch one-half revolution, the code actuated switch cam follower rests on the high portion of the code actuated switch cam locking the code plates.

(5) The operations described in (1) through (4) above are summarized in the following sequence chart.

Code Plate Registering Sequence Chart

1 Code actuated switch function shaft starts turning.
2 Code actuated switch cam follower moves out of the indent of the code actuated switch cam on code actuated switch function shaft.
3 Code actuated switch follower, register lever, and register arm pivot.
4 Blade on register arm engages notches on code plates, positioning and locking them.

Note. The actions described in the Pulsing Sequence Chart begin at this point in the sequence of operation.

5 Code plates held in place. Code actuated switch function shaft continues its ½ rotation.
6 Code actuated switch cam follower drops to low part of code actuated switch cam.
7 Code actuated switch cam follower, register lever, and register arm pivot back to original position.
8 Register arm blade moves free of code plates, releasing them.
9 Code actuated switch function shaft stops.

c. Pulsing Mechanism Operation. The code actuated switch pulsing contacts (S19) and the receiving multisolenoid pulsing contacts (S20) on the back end of the code actuated switch function shaft perform two main functions. The receiving multisolenoid pulsing cam on the shaft operates

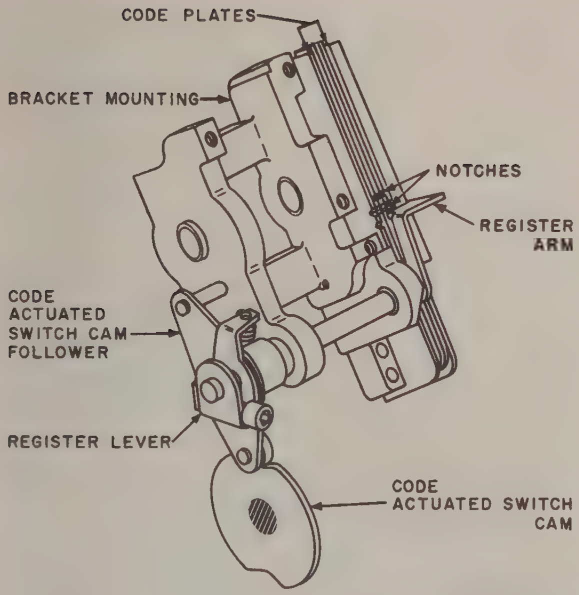

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Figure 120. Code plate registering and locking mechanism.

the code actuated switch pulsing contacts (S19). The receiving multisolenoid pulsing cam next to it controls the circuit through the receiving multisolenoid pulsing contacts (S18) to the perforator latch, causing the perforator latch to unlatch and allowing the receiving multisolenoid function shaft to turn. In this manner the code actuated switch function shaft controls the starting of the receiving multisolenoid function shaft.

(1) After the selection, transfer, and registering of the code plates has taken place, the circuits of the code actuated switch must be pulsed electrically to transfer the code setting to the receiver multisolenoid. This pulsing is controlled by the action of the receiving multisolenoid pulsing cam against the receiving multisolenoid pulsing contacts (S18). As the code actuated switch function shaft turns, the high portion of the receiving multisolenoid pulsing cam (fig. 121) strikes the actuating mechanism of the receiving multisolenoid pulsing contacts (S18) to close the circuit. The receiving multisolenoid pulsing cam is so mounted on the code actuated switch function shaft that this action does not take place until the code plates have been registered and locked. As the code actuated switch function shaft continues to rotate, the circuit is broken as the high portion of the receiving multisolenoid pulsing cam moves away from the actuating mechanism of the receiving multisolenoid pulsing contacts (S18).

(2) The code actuated switch pulsing cam on the code actuated switch function shaft operates the code actuated switch pulsing contacts (S19) which is not wired in a circuit.

(3) The operations described in (1) and (2) above are summarized in the pulsing sequence chart below.

Code Actuated Switch Function Shaft Pulsing Sequence Chart

1 Code plates held in place. Code actuated switch function shaft continues its ½ revolution.
2 High part of receiving multisolenoid pulsing cam strikes actuating mechanism of the receiving multisolenoid pulsing contacts (S18).
3 Receiving multisolenoid pulsing contacts (S18) close, pulsing the circuits of the receiving multisolenoid and energizing the perforator latch coils (L3) which permits the receiving multisolenoid function shaft to rotate.
4 High part of code actuated switch pulsing cam strikes actuating mechanism of the code actuated switch pulsing contacts (S19)
5 Code actuated switch pulsing contacts (S19) not wired.
6 High part of code actuated switch pulsing cam moves away from actuating mechanism of code actuated switch pulsing contacts (S19).
7 High part of receiving multisolenoid pulsing cam moves away from actuating mechanism of receiving multisolenoid pulsing contacts (S18).
8 Receiving multisolenoid pulsing contacts (S18) open, deenergizing the circuits of the perforator latch coils (L3) and the receiving multisolenoid.
9 Code actuated switch function shaft stops.

98. Receiving Multisolenoid Operation

a. The receiving multisolenoid converts the code group received simultaneously through the 11-wire circuit from the code actuated switch into mechanical settings which can subsequently be interpreted into a printed and perforated tape message. The basic operation of the receiving multisolenoid consists of the energizing of one of two solenoid coils (fig. 122) for each of the five code impulses. The solenoid coils move multisolenoid plungers which, in turn, move the five multisolenoid Y-levers to one of two settings. Which solenoid coil will be energized is determined by whether a marking or spacing circuit was closed by the code actuated switch.

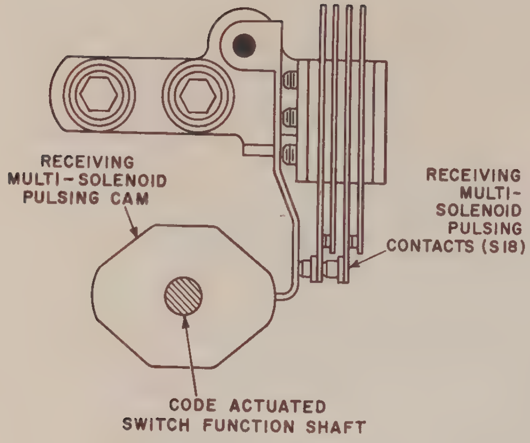
RECEIVING MULTI-SOLENOID PULSING CAM
RECEIVING MULTI-SOLENOID PULSING CONTACTS (S18)
CODE ACTUATED SWITCH FUNCTION SHAFT

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Figure 121. Code actuated switch function shaft pulsing mechanism.

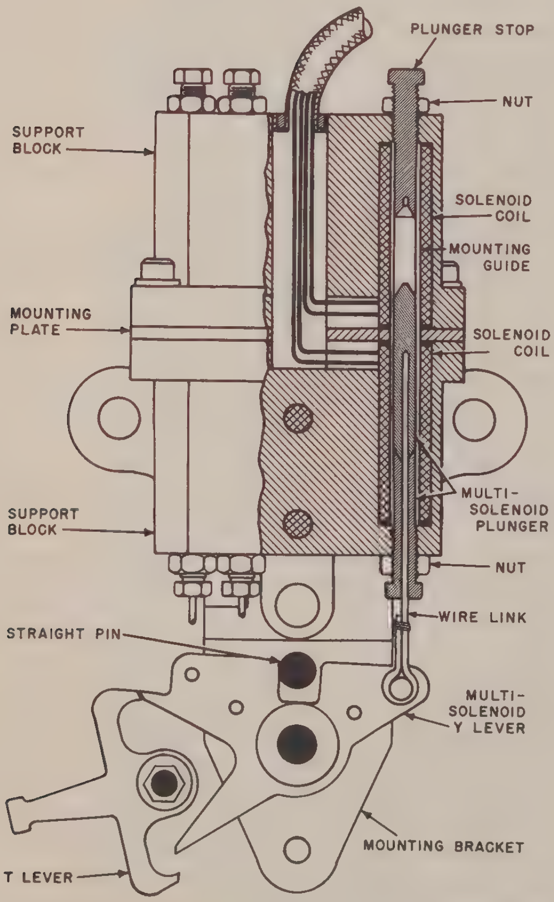

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Figure 122. Receiver, multisolenoid, cutaway view.

b. The receiver multisolenoid consists of an upper support block and a lower support block (fig. 122). Each of these blocks have five passages drilled into them to allow for the insertion of five solenoid coils. The passages are spaced in such a way that each passage in the upper support block alines with a matching passage in the bottom support block when the two blocks are assembled. Since the solenoid coils have hollow cores, tubular mounting guides are inserted in such a way that they create five passages extending from the bottoms of the coils in the lower support block to the tops of the coils in the upper support block.

c. Multisolenoid plungers are inserted in the mounting guides. These multisolenoid plungers are made of ferrous metals which react to a magnetic field. Wire links are integral with the multisolenoid plungers and extend out of the bottom of the lower support block. The ends of the wire links are fastened to the multisolenoid Y-levers (fig. 122) which are free to pivot on a post under the center of the receiver multisolenoid. Any up or down movement of the multisolenoid plungers is transferred to the multisolenoid Y-levers in the form of clockwise or counterclockwise movement about the pivot post.

d. When the code impulses are received from the code actuated switch through the 11-wire circuit, either the top or the bottom solenoid coil of each of multisolenoid Y-lever is energized, depending upon whether the code impulse is a mark or a space. The energized solenoid coil sets up a magnetic field of force which attracts the ferrous multisolenoid plunger, pulling it into whichever coil is energized. This movement of the multisolenoid plunger is transferred by a wire link to the multisolenoid Y-levers below the receiver multisolenoid.

e. The solenoid coils are wired so that they cause the associated multisolenoid Y-levers to rotate clockwise for a marking impulse and counterclockwise for a spacing impulse. To accomplish this, it is necessary to reverse the two marking and spacing positions of the solenoid coils to the right of the multisolenoid Y-lever centerline in relation to the three positions of the solenoid coils to the left of the multisolenoid Y-lever centerline. The multisolenoid plungers that control multisolenoid Y-levers 1, 3, and 5 are installed in the left side of the receiver multisolenoid, and are connected to the multisolenoid Y-levers to the left of the pivot post. When the upper solenoid coils of these multisolenoid Y-levers are energized, the multisolenoid plungers rise, pivoting the multisolenoid Y-levers clockwise to a marking position; when the lower solenoid coils are energized, the multisolenoid plungers are pulled down, pivoting the multisolenoid Y-levers counterclockwise to the spacing position. This action is reversed on multisolenoid Y-levers 2 and 4, since the multisolenoid plungers are connected to the multisolenoid Y-levers on the opposite side of the pivot post. When the multisolenoid plungers rise into the upper solenoid coils, the multisolenoid Y-levers are pivoted counterclockwise to a spacing position. When the multisolenoid plungers are pulled into the lower solenoid coils, the multisolenoid Y-levers are pivoted clockwise to a marking position.

99. Transfer Operation from Multisolenoid Y-Lever Settings

a. Perforator Latch Operation.

(1) The perforator latch controls the operation of the transfer mechanism and the receiving multisolenoid function shaft. It accomplishes this by releasing the clutch latch arm, which allows the T-levers to move against the multisolenoid Y-levers and also releases the receiving multisolenoid function shaft, allowing it to make its one-half revolution.

(2) When the receiving multisolenoid pulsing contacts (S18) are operated by the receiving multisolenoid pulsing cam on the code actuated switch function shaft they energize the perforator latch coils (L3). The perforator latch coils (L3) induce a magnetic field of force in their cores. This magnetic field of force attracts the lever latch armature (fig. 123) which is connected to the lever latch. When the lever latch armature moves toward the perforator latch coils (L3), the lever latch pivots clockwise, releasing the clutch release lever. This allows the clutch latch arm to move cockwise, releasing the arm of the sliding clutch drum to engage the gear on the receiving multisolenoid function shaft, driving the receiving multisolenoid function shaft.

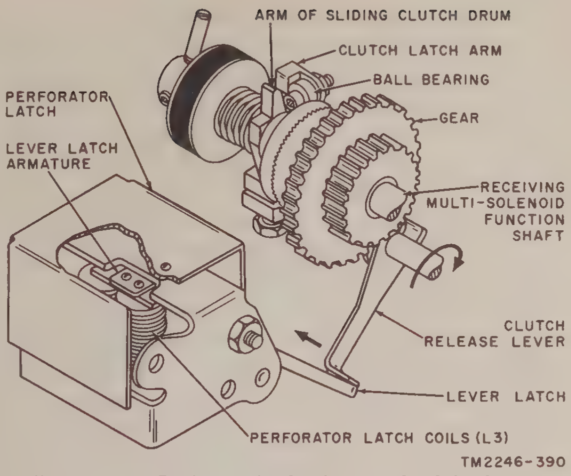

Figure 123. Perforator latch releasing clutch latch arm.

b. Transfer Lever Operation.

(1) The clutch latch arm and the transfer lever are connected to the same shaft, and when the clutch latch arm is released, it also releases the transfer lever. The pressure of the transfer lever spring causes the transfer lever to pivot to bring the T-levers against the multisolenoid Y-levers. At this instant, each multisolenoid Y-lever positioned clockwise engages the upper arm of its associated T-lever, turning the T-lever counterclockwise. This turning of the T-lever moves its associated code ring in a clockwise direction (fig. 124). The reverse action occurs and the associated code ring is moved counterclockwise for each multisolenoid Y-lever that is positioned counterclockwise.

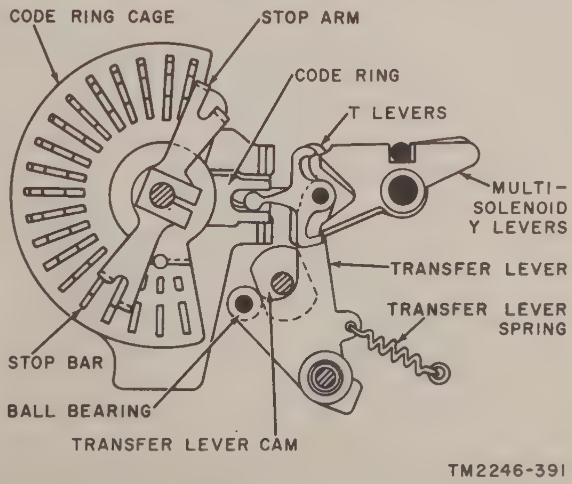

Figure 124. Transfer mechanism operated.

(2) Each code ring has selecting notches cut into the inner and outer edges of the

curved portion of the code ring (fig. 124). After the transfer operation positions the code rings, the code rings are arranged so that a notch in each of the rings is in line with a notch in the other four at one point around the circumference of the ring. At this point, a groove is formed under the stop bar to be selected. The pressure of the stop bar compression spring (fig. 75) pushes the selected stop bar into the groove, placing one end of the bar into position to stop rotation of the stop arm as described in paragraph 100*d*. The stop bar, in a notch set up by the preceding code group, is pushed outward by the sloping surfaces at the side of a notch in one or more of the code rings when the transfer operation occurs.

(3) The operations listed in (1) and (2) above are summarized in the following sequence chart:

Transfer Lever Operation Sequence Chart

1 Perforator latch coils (L3) energized.
2 Perforator latch coils (L3) trip latching mechanism, releasing clutch latch arm.
3 Clutch latch arm and transfer lever pivot clockwise.

Note. The action described in the Function Shaft Operation Sequence Chart begins at this point in the sequence of operation

4 Transfer lever moves five T-levers against multisolenoid Y-levers.
5 Multisolenoid Y-levers position T-levers.
6 T-levers position code rings, forming notch in code rings.
7 Selected stop bars pushed into notch in code rings.
8 Previously selected stop bar pushed out by new setting of code rings.

c. Restoring Transfer Lever. The T-levers must be moved away from the multisolenoid Y-levers before the next code group can be set up in the multisolenoid Y-levers. This action is accomplished when the transfer lever is restored and the clutch latch arm is latched.

(1) The transfer lever is moved in a counterclockwise direction by the action of the transfer lever cam (fig. 124) mounted on the front end of the receiving multisolenoid function shaft. As the function shaft makes its one-half revolution, the transfer lever cam rises against the ball bearing on the transfer lever, moving the transfer lever and the clutch latch arm to the restored position. By this time the perforator latch coils (L3) have been deenergized and the lever latch is again in a position to engage the clutch release lever. As it nears the restored position, the ball bearing on the clutch latch arm moves against the arm of the sliding clutch drum, disengaging it from the gear. This breaks the power train to the receiving multisolenoid function shaft, stopping rotation. At the same time the clutch release lever is latched by the lever latch holding the clutch latch arm and the transfer lever in position for the next pulsing of the perforator latch coils (L3).

(2) The operations described above are summarized in the following sequence chart:

Transfer Lever Sequence Chart

1 Sliding clutch drum meshes with the receiving multsolenoid function shaft gear.
2 Receiving multisolenoid function shaft starts to rotate.
3 Transfer lever cam strikes transfer lever ball bearing.
4 Transfer lever pivots counterclockwise pivoting the T-levers and clutch latch arm at the other end of the transfer lever shaft with it.
5 Ball bearing on clutch latch arm strikes arm on sliding clutch drum.
6 Sliding clutch drum pulled out of mesh with gear.
7 Receiving multisolenoid function shaft stops.
8 Clutch release lever latched by lever latch.
9 Clutch latch arm and transfer lever retained in restored position.

100. Translating Stop Bar Settings Into Type Wheel Positions

a. Code-Ring Selection of Stop Bars. Though the code-ring cage of the perforator is set at an angle perpendicular to the code cage of the page printing mechanism, the selection of the stop bars by the code rings is identical to the operation in the page printing mechanism. Refer to paragraph 61*d* and *e* for a complete description of the operation.

b. Stop Bar Arrangement. The 32 stop bars are arranged in one inner and one outer row about a semicircle in the code-ring cage. The ends of the outer stop bars move inward when selected. The ends of the inner stop bars move outward when selected. The stop arm has one inner and one outer projection on each end for engaging a selected stop bar. The inner projections of the stop arm halt the arm halfway between the outer stop arm positions. The character or function assigned to each stop bar is shown in figure 125. Of these, 26

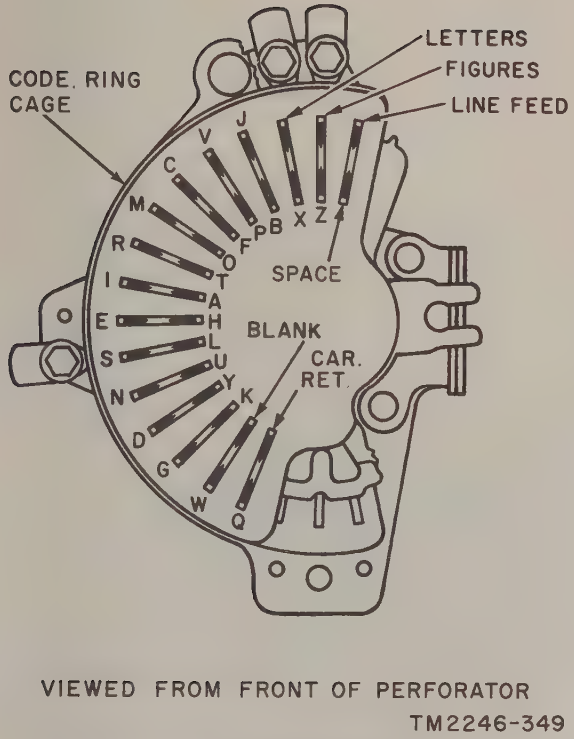

Figure 125. Characters and functions which the stop bars operate.

are used for the alphabet and 6 are used for the operations described below.

(1) Reception of the letters shift or figures shift code group causes the received code group to be punched in the tape and the type wheel to be positioned for printing letters or figures. No symbol is printed on the tape for these code groups.

(2) Reception of the carriage return, line feed, and blank code groups do not cause any mechanical operation in the perforator other than recording the code group in punched and printed form on the tape. This is also true with the space code group, except that no symbol is printed.

(3) Reception of the S code group while the perforator is in the figures shift position causes the signal bell to ring. The code group also is punched in the tape and the bell-like symbol is printed.

c. Code-Ring Locking Arrangement. During a printing or function cycle of operation in the perforator, the code rings are locked in position by the code ring locking bail (fig. 126). The code rings remain locked in position for almost one-half revolution of the receiving multisolenoid function shaft. As the receiving multisolenoid function shaft reaches the end of one-half revolution, the code-ring locking bail releases the code rings to permit positioning of the code rings for the next code group. The type wheel and function lever cam of the friction clutch on the receiving multisolenoid function shaft has two type wheels and function cam studs mounted 180° apart. While the code impulses are being stored in the selector mechanism, the receiving multisolenoid function shaft is motionless with one stud just under the code-ring locking bail cam follower. When the receiving multisolenoid function shaft starts rotating, this type wheel and function lever cam stud moves counterclockwise, allowing the code-ring locking bail cam follower spring on the code-ring locking bail cam follower to pull the code-ring locking bail cam follower downward. Because the code-ring locking bail cam follower and the code-ring locking bail are mounted on the code-ring locking bail shaft, the code-ring locking bail also will move downward against the code rings, locking them in position. When the receiving multisolenoid function shaft approaches the end of its one-half revolution, the opposite type wheel and function lever cam stud on the type wheel and function lever cam will move the code-ring locking bail cam follower and the code-ring locking bail upward. This unlocks the code rings, preparing them to receive the next code group.

d. Stop-arm Shaft Operation.

(1) The stop-arm shaft (fig. 127) is driven by the receiving multisolenoid function shaft through a friction clutch and gear arrangement and drives the type wheel

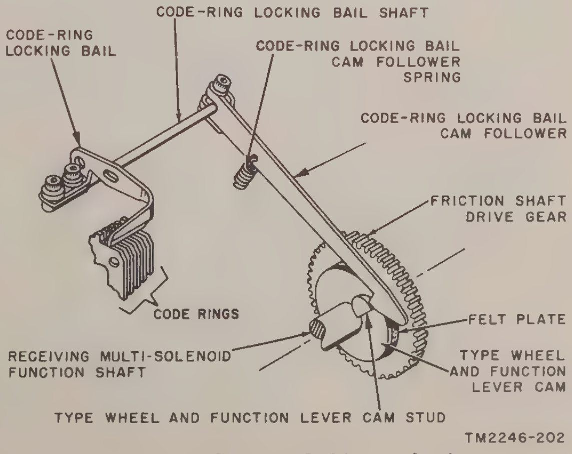
CODE-RING LOCKING BAIL SHAFT
CODE-RING LOCKING BAIL
CODE-RING LOCKING BAIL CAM FOLLOWER SPRING
CODE-RING LOCKING BAIL CAM FOLLOWER
FRICTION SHAFT DRIVE GEAR
CODE RINGS
FELT PLATE
RECEIVING MULTI-SOLENOID FUNCTION SHAFT
TYPE WHEEL AND FUNCTION LEVER CAM
TYPE WHEEL AND FUNCTION LEVER CAM STUD
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Figure 126. Code-ring locking mechanism.

hub assembly and type wheel and turns the stop arm. The stop arm and type wheel are alined so that the desired character will appear on the type wheel in the printing position when the selected stop bar stops rotation of the stop arm. Thus, the position of the code rings and stop bars determines the character or symbol to be printed and punched.

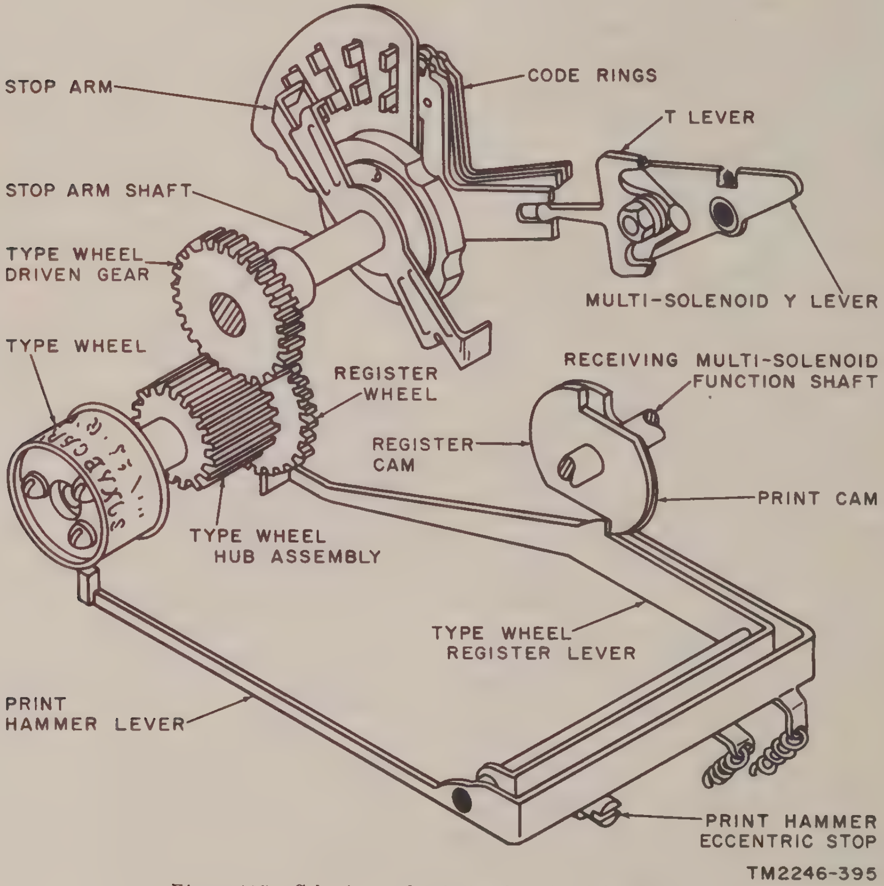

Figure 127. Selecting and printing functional diagram.

(2) Because the stop-arm shaft must be positioned accurately in order to select the proper characters and functions, little bouncing can be tolerated when rotation of the stop arm is halted by a stop bar. To prevent excessive bouncing, an antibounce clutch (fig. 76) is mounted on the stop arm shaft between the code ring cage and the stop arm. The central portion of the antibounce clutch is fastened to the stop arm shaft. The outer part of the antibounce clutch is locked in place by a stud on the code ring cage. Four rollers in the clutch are spring loaded in notches cut into the center portion of the clutch at an angle that permits only clockwise rotation of the stop arm shaft. The rollers roll along the inside surface of the cylindrical housing. Any attempt to make the stop arm shaft rotate counterclockwise immediately causes the rollers to jam between the housing and the moving part of the antibounce clutch. Thus, any tendency to reverse direction is minimized.

101. Printing Operation

The printing operation in perforators is accomplished by the mechanism shown in simplified form in figure 127. Portions of the selector and transfer mechanisms are included in this illustration to show the relationship between all the mechanisms concerned. The printing operation is described in the remainder of this paragraph.

a. Selecting Character or Symbol. A type wheel contains the raised letters of the alphabet, symbols, and figures that may be printed by this perforator. The type wheel is driven by the type wheel hub assembly on the stop-arm shaft. Rotation of the stop arm shaft will rotate the type wheel.

(1) After a received code group has been set up on the code rings, the stop arm rotates until it is stopped by one of the stop bars of the code ring cage. The type wheel, geared to the stop arm shaft, also rotates and when stopped, the letter on the type wheel corresponding to the stop arm position will appear directly above the print hammer lever. The perforator can stop the type wheel in any of 32 positions, as the unit includes 32 stop bars, each in a different position in the code-ring cage. Of the 32 posisible type wheel positions, 26 are used for letters of the alphabet, 3 are for symbols, and 3 are blank and do not print.

(2) When the type wheel is in figures shift, the type wheel positions used for the alphabet are used for numerals, punctuation marks, and communication symbols (fig. 51). Rotation of the stop arm, therefore, control rotation of the type wheel which, in turn, brings the desired character to the printing position directly above the print hammer lever. Operated by another mechanism, the print hammer lever moves upward sharply at the proper instant, striking the message tape and inking ribbon against the character on the type wheel.

b. Printing Character or Symbol. The printing operation is controlled by the rotation of the print and register cams on the receiving multisolenoid function shaft (fig. 127). The receiving multisolenoid function shaft begins one-half revolution immediately after a stop bar is selected.

(1) The type wheel register lever, riding against the register cam on the receiving multisolenoid function shaft, is pulled sharply upward by spring action when a high part of the register cam passes the contacting surface of the type wheel register lever. The blade at the left end of the type wheel register lever engages a notch of the register wheel, locking the type wheel in the desired character position. At the same time, the print hammer eccentric stop attached to the type wheel register lever moves downward, no longer blocking rotation of the print hammer lever. As a high portion of the print cam rotates past the contacting surfaces of the print hammer lever, the print hammer lever is pulled sharply upward by a spring. The print hammer lever strikes the message tape, pressing the inking ribbon against the desired character on the locked type wheel. After the character has been printed, the register cam moves the type wheel register lever downward, disengaging the register wheel and the type wheel is free to rotate for printing the next character.

(2) Printing does not occur when the letters shift, figures shift, or space code group is received. The stop bars for these operations halt rotation of the stop arm at a position that causes a high portion of the register wheel to stop directly above the blade of the type wheel register lever. When the register cam permits the type wheel register lever to begin moving upward, it strikes against the portion of the register wheel that has no teeth cut into it. This prevents the type wheel register lever from moving fully to the upward position, and the print hammer lever eccentric stop continues to block rotation of the print hammer lever. With the stop in this position, the print hammer lever cannot follow the print cam surface and printing is prevented.

(3) The selection and printing operation described above is summarized in the following sequence chart.

Printing Operation Sequence Chart

1 Printing operation sequence started by transfer operation; receiving multisolenoid function shaft starts to rotate.
2 Stop arm released by previously dropped stop bar. Type wheel reciprocating spring lever begins to push type wheel reciprocating transfer lever toward figures-letters shift lever (par. 106).
3 Stop arm stopped by selected stop bar. Type wheel stopped in corresponding position.
4 Type wheel moves forward, carrying the inking ribbon with it. Movement of the type wheel is halted by figures-letters shift latch and held under spring tension.
5 Register cam releases type wheel register lever. Spring tension moves type wheel register lever to engage register wheel if a character is to be printed.
6 Print cam releases print hammer lever, which allows spring to drive hammer against type wheel to print the character.
7 Type wheel register lever is withdrawn from the register wheel by register cam.
8 Print hammer lever is moved away from the type wheel by print cam.
9 Multisolenoid function shaft clutch is disengaged. Multisolenoid function shaft stops.

102. Tape Punching and Feeding Operations

In addition to printing messages on a message tape, as described in paragraph 101, the perforator records the code impulses of each received code group in the form of punched code holes in the message tape. Shown in figure 51 at the right of the code chart is a message tape containing information in perforated form. The code impulses are recorded as a row of holes across the tape. This perforated portion of a message tape is subdivided into six columns; five for the code impulse holes and one for the tape feed hole. The first column along the edge opposite the printing is reserved for recording the first code impulse. When it is a marking impulse, a code hole is punched in this column, and when it is a spacing impulse, a hole is not punched. The second column is used to record the second code impulse in a like manner. The third column consists of a continuous row of smaller holes which are used for feeding the message tape through the perforator. The remaining three columns are used for the third, fourth, and fifth code impulses. Start and stop impulses are not recorded in perforated form because the transmitter-distributor mechanism automatically provides these impulses. Operation of the mechanism which perforates the code and feed holes and feeds the message tape is described in *a* through *c* below.

a. Code Hole Punching Selection. This operation begins when the code impulses of a received code group are stored in the code rings. The lower end of each of the five code rings mates with a set of 5-punch interference levers as shown in figure 128. These levers transfer the code ring settings to the punching mechanism.

(1) When a code ring is positioned counterclockwise to record a spacing impulse, the mating punch interference lever is rotated clockwise (fig. 128). The lower arm moves away from the raised portion of its corresponding code hole punch lever and a hole will not be punched when the punching operation occurs.

(2) When a code ring is positioned clockwise to record a marking impulse, the mating punch interference lever rotates counterclockwise. This causes the lower arm of the punch interference lever to move in the blocking position directly above the raised portion of its code hold punch lever. When the punching operation occurs, a hole will be punched in the message tape to record this code impulse.

(3) The five code punch bars and the feed punch bar are mounted in the code die assembly and are held in place by a stripper (fig. 129). Each of the code punch bars is engaged by an associated code hole punch lever. The feed punch bar is smaller in diameter than the code punch bars. The feed punch lever is slightly different from the code hole punch levers. It does not have a raised portion like the code hold punch levers, but is hooked around the shaft on the punch arm assembly. This arrangement causes it to raise the feed punch bar during the punching operation and perforate a feed hole in the tape each time the receiving multisolenoid function shaft rotates.

b. Punching Operation. This operation occurs after the transfer operation positions the punch interference levers in accordance with the received code impulses. One-half revolution of the print and register cam, mounted on the receiving multisolenoid function shaft (fig. 129), provides the

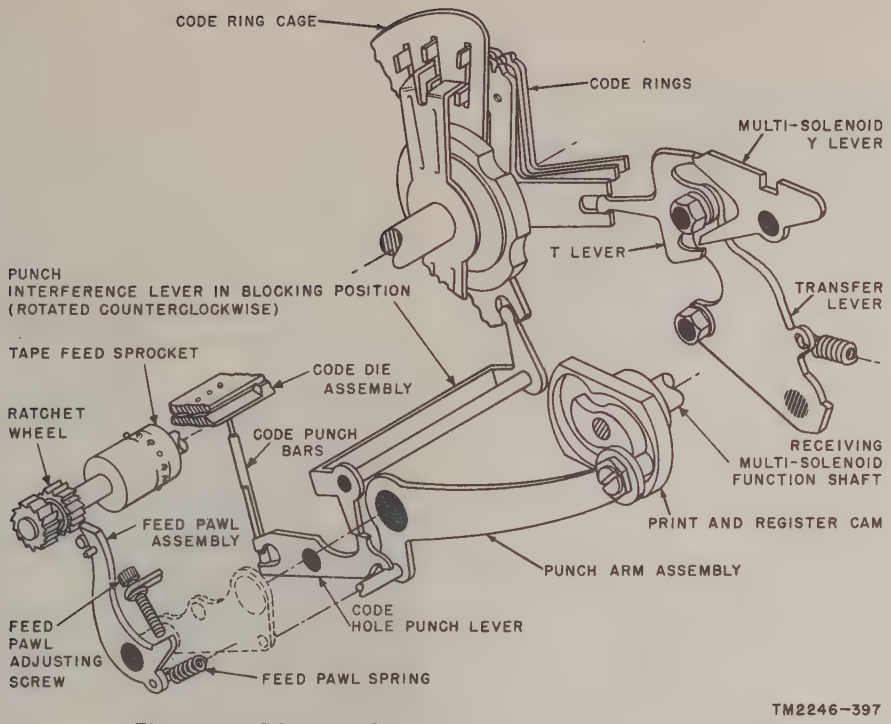

Figure 128. Selecting and punching mechanism, functional diagram.

power required for the punching operation. The print and register cam starts one-half revolution when the receiving multisolenoid function shaft rotates. As the print and register cam revolves, it moves the roller end of the punch arm assembly downward and causes the opposite end, engaging the five code hole punch levers, to move upward toward the code punch bars. The code hole punch levers that are blocked by the lower arm of the mating punch interference levers push their respective code punch bars upward through the message tape to record marking code impulses. The code hole punch levers that are not blocked by the lower arm of the punch interference levers pivot counterclockwise slightly on the shaft of the punch arm assembly and do not perforate the message tape to record spacing code impulses.

c. Message Tape Feeding Operation. Message tape feeding in the perforator is accomplished by a slight rotation of the tape feed sprocket (fig. 130), as it feeds the message tape one space for each code group received. The pins in the tape feed sprocket engage the feed holes in the message tape and force the message tape to move when the tape feed sprocket turns. Message tape feed-

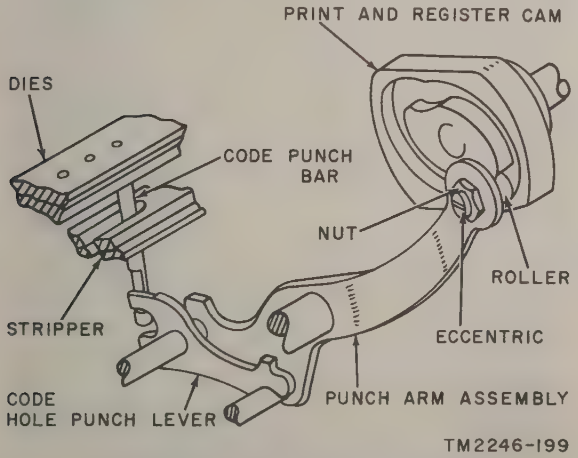

Figure 129. Basic punching mechanism.

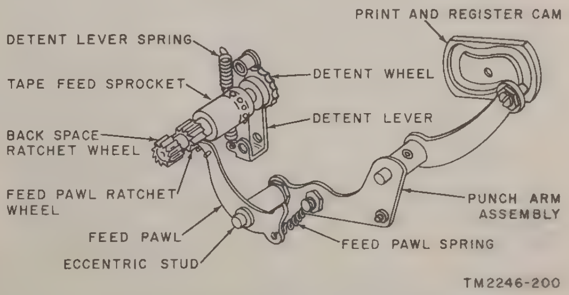

Figure 130. Basic message tape feed mechanism.

ing occurs immediately before the message tape is punched.

(1) Power for message tape feeding is provided by the punch arm assembly when it begins the punching operation. As the code hole punch lever end of the punch arm assembly moves upward, it causes the feed pawl to engage and rotate the feed pawl ratchet wheel, feeding the message tape. The feed pawl must not be permitted to continue turning the back space ratchet wheel during the punching operation or the message tape will be damaged. Proper adjustment of the feed pawl eccentric stud causes the feed pawl to rotate free of the feed pawl ratchet wheel immediately before the message tape is punched.

(2) At all times, except during message tape feeding, the tape feed sprocket is held motionless by the detent wheel, the detent lever, and a detent lever spring (fig. 130). The detent wheel is attached firmly to the shaft that contains the tape feed sprocket and back space ratchet wheel. The detent lever spring causes the detent lever to exert a constant pressure against the detent wheel. This pressure also is used to complete message tape feeding. As the feed pawl pushes and immediately releases the feed pawl ratchet wheel, the pressure of the detent lever against the detent wheel completes the feeding operation.

d. Summary. The message tape feeding and punching operations described above are summarized in the following sequence chart.

Message Tape Feeding and Punching Operation Sequence Chart

1 Sequence starts with unlatching of clutch latch arm, receiving multisolenoid function shaft starts to revolve.

2 Punch interference levers, actuated by code rings, are positioned in accordance with received code impulses. For spacing inpulses, lower arm of punch interference levers moves to space position and swings clear of raised portion of mating code hole punch levers. For marking impulses, lower arm of punch interference levers moves to blocking position above raised portion of mating code hole punch levers.

3 Punch arm assembly begins to pivot, operated by print and register cam.

4 Feed pawl engages back space ratchet wheel.

5 Message tape is moved forward one character space. Detent lever and detent wheel hold message tape stationary.

6 Continued rotation of punch arm assembly forces code hole punch levers that are blocked by punch interference levers to drive code punch bars through message tape. Other code punch bars remain in lower position. Feed punch lever drives feed punch bar through message tape on every upward movement of punch arm assembly.

7 Print and register cam returns punch arm assembly to original position, withdrawing code punch bars and feed punch bar from message tape.

8 Feed pawl is positioned for the next tape feeding operation.

9 Receiving multi solenoid function shaft clutch arm is disengaged. Receiving multisolenoid function shaft stops.

103. Manual Tape Feed-Out Operation

A manually operated mechanism is included in this perforator to permit feeding message tape out of the unit while messages are not being received and the perforator control switch (S31) is in REPERF position. To accomplish this, the operator merely operates the manual tape feed-out lever (fig. 41), and releases it when sufficient message tape has been fed. Manual operation of the manual tape feed-out lever positions the multisolenoid Y-levers for the blank code group (fig. 51) and pulses the perforator latch coils (L3). The printing mechanism prints the blank signal, the perforating mechanism records the blank code group in the message tape, and the tape feed mechanism feeds the message tape. If a code group is received while the manual tape feed-out lever is operated, the perforator automatically disables the manual tape feed-out mechanism and the perforator records the incoming message. Detailed operation of the manual tape feed-out mechanism (fig. 131) is described in *a* and *b* below.

a. Manual Tape Feed-Out. When the manual tape feed-out lever is pivoted counterclockwise, the tape feed-out shaft and the clamp, which are connected to the tape feed-out shaft, also pivot (fig. 131). As the clamp pivots, it moves against the kickout pawl which is mounted on a stud on the switch operating lever. This causes the switch operating lever to pivot counterclockwise also. When this occurs, the manual tape feed-out link, which is connected to the left of the pivot point, is pulled downward, pulling down with it the multisolenoid Y-levers. This setting of the Y-levers is the setting for the blank code group. A projection at the end on the switch operating

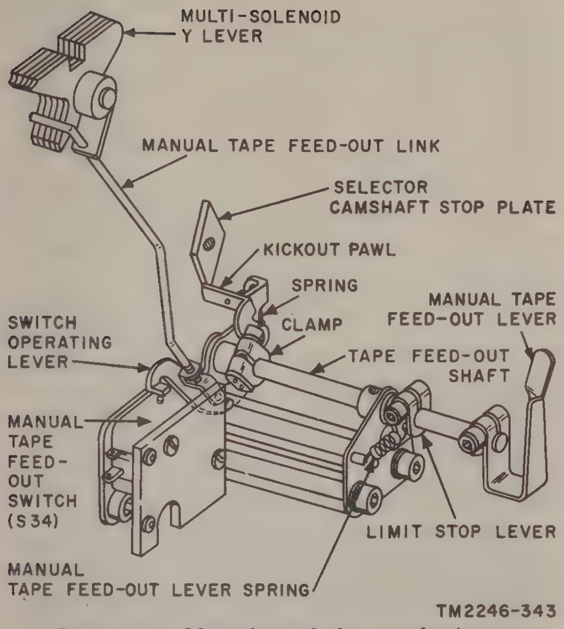
MULTI-SOLENOID Y LEVER
MANUAL TAPE FEED-OUT LINK
SELECTOR CAMSHAFT STOP PLATE
KICKOUT PAWL
SPRING
MANUAL TAPE FEED-OUT LEVER
SWITCH OPERATING LEVER
CLAMP
TAPE FEED-OUT SHAFT
MANUAL TAPE FEED-OUT SWITCH (S34)
LIMIT STOP LEVER
MANUAL TAPE FEED-OUT LEVER SPRING
TM2246-343

Figure 131. Manual tape feed-out mechanism.

lever strikes a switch plunger, closing the manual tape feed-out switch (S34). The closing of the switch energizes the perforator latch coils (L3), releasing the clutch latch arm and allowing the receiving multisolenoid function shaft to turn. The rotation of receiving multisolenoid function shaft causes the transfer, selection, printing, and punching of the blank code group in the message tape, feeding out the message tape as long as the manual tape feed-out lever is held in the counterclockwise position.

b. Effects of a Received Code Group. If a code group is received by the selector magnet (E9) during the operation of the manual tape feed-out mechanism, the mechanism is disabled immediately upon receipt of a start impulse which causes the selector camshaft to begin rotation in the normal manner. When the manual tape feed-out mechanism is in the operated position, the upper extension of the kickout pawl is positioned in the path of the stop plate of the selector camshaft (fig. 131). As the selector camshaft rotates, the stop plate moves the kickout pawl out of the path of the clamp. The switch operating lever is released from the clamp and is free to react to the tension of the spring applied downward at the right end of the switch operating lever. The spring pivots the switch operating lever clockwise, moving the manual tape feed-out link out of engagement with the multisolenoid Y-levers. It also releases the switch plunger, opening the manual tape feed-out switch (S34). This deenergizes the perforator latch coils (L3) which causes the clutch latch arm to move the sliding drum clutch out of engagement. The receiving multisolenoid function shaft stops. The kickout pawl remains in the unlatched position until the manual tape feed-out lever is restored to its normal position. The incoming code groups continue in their normal sequence and are not affected by the manual tape feed-out operation.

104. Ribbon Feed and Ribbon Reverse Operations

The ribbon mechanism includes two ribbon spools and sufficient inking ribbon to fill only one ribbon spool. As the receiving multisolenoid function shaft operates in response to received messages, the inking ribbon is unwound automatically from one ribbon spool and wound onto the other. When the inking ribbon is almost entirely wound on one ribbon spool, the ribbon mechanism automatically reverses the direction of ribbon feed and begins to wind on the empty ribbon spool. The mechanisms that accomplish the feeding and reversing actions are described in *a* and *b* below.

a. Ribbon Feeding Operation. Power to operate the ribbon feed and ribbon reverse mechanism is supplied by the ribbon feed cam on the receiving multisolenoid function shaft (fig. 111). As the receiving multisolenoid function shaft revolves during reception of code groups, it causes the ribbon feed cam follower to pivot about the eccentric stud, and swing to the left and right (fig. 132). The cam has only one high and one low portion. Reception of every other code group causes the ribbon feed mechanism to feed the inking ribbon. The feed mechanism includes a driving link lever, two ribbon feed detents, two ribbon feed detent wheels, and two ribbon feed levers, one of each for each ribbon spool. The two ribbon feed levers are mounted on a U-shaped driving link lever, which is coupled to the ribbon feed cam follower. As the ribbon feed cam follower pivots to the left, it moves the driving link lever upward. One ribbon feed lever engages its ribbon feed detent wheel and rotates the ribbon spool enough to feed the inking ribbon one character space. On the downward stroke of the driving link lever, the ribbon feed lever also is moved downward in preparation for the next feed stroke. The opposite ribbon feed lever moves up and down also but is

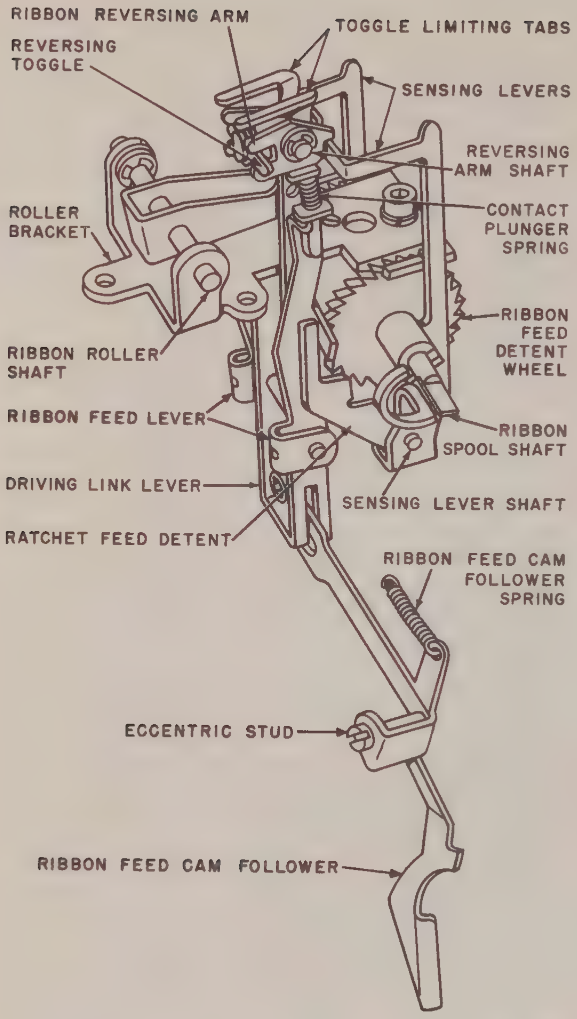

Figure 132. Ribbon feed and reversing mechanism.

held away from its mating ribbon feed detent wheel by the ribbon reversing arm. A ribbon feed detent and spring prevent each ribbon feed detent wheel from rotating freely.

b. Ribbon Reversing Operation. The ribbon feed mechanism automatically reverses the direction of feed when the last turn of inking ribbon has been unwrapped from one ribbon spool. When this ribbon spool is empty, a window in the spool hub is uncovered, and a portion of the associated sensing lever moves forward through the opening. As the sensing lever pivots forward (fig. 132), the upper arm of the sensing lever moves into the vertical path of the ribbon reversing toggle arm. On the next downward movement of the driving link lever, the ribbon reversing arm, which is spring-loaded, is held stationary at the rear by the sensing lever. The front end pivots downward, carrying with it the engaged end of the reversing toggle. This action causes the ribbon feed detent of the full ribbon spool to move away from its mating ribbon feed detent wheel, and the other ribbon feed detent to move toward its mating ribbon feed detent wheel. As the perforator continues to operate in response to received messages, the ribbon feed lever associated with the empty ribbon spool now engages its associated ribbon feed detent wheel on each upward movement, and the inking ribbon begins to wind on the empty ribbon spool. This reversing action occurs automatically as each ribbon spool, in turn, becomes empty.

105. Stop Bar Selection of Functions

In addition to recording messages in printed and punched form on message tape, the perforator is capable of performing three mechanical operations called functions. These are the letters-shift function, the figures-shift function, and the signal bell function.

a. Description. A stop bar for each function is located in the code ring cage (fig. 125). The signal bell function shares the same stop bar used for selecting the letter S. The stop bars for these functions are longer than other stop bars; the additional length extends beyond the other bars at the rear of the code ring cage. Three sensing levers, one for each function, are mounted on the stop arm shaft directly behind the code-ring cage. Springs apply tension to the sensing levers and pull each toward its respective stop bar. When the cam lever assembly is on the high part of the sensing lever restoring cam it holds the sensing levers away from the stop bars while an incoming code group is being set up in the code-ring cage. After the transfer operation, the sensing lever restoring cam and cam lever assembly move to the low part of the sensing lever restoring cam and permit the sensing levers to be pulled toward their stop bars. Each of the function stop bars, when not selected, blocks the path of its respective sensing lever.

b. Operation. The function sensing operation begins after the transfer operation positions the code rings. As the sensing lever restoring cam on the receiving multisolenoid function shaft begins to rotate, a low portion of the sensing lever restoring cam permits the cam lever assembly (fig. 134) to move toward the multisolenoid function shaft, allowing the sensing lever springs to pull each sensing lever toward its associated stop bar.

(1) If the code rings have not selected one of the function stop bars, the sensing levers rotate until each sensing lever strikes its stop bar. The sensing levers remain in this blocked position until they are restored by the cam lever assembly and sensing lever restoring cam.

(2) If the code rings select one of the function stop bars, the three sensing levers move toward their stop bars until the two not selected are halted by their stop bars. The selected stop bar is not in position to block the sensing lever of the desired function, and the sensing lever rotates past the stop bar (figs. 125 and 134), causing operation of the associated function mechanism. When a function stop bar is in the selected position, the front end moves into the notch formed by the code rings and raises the rear extension of the stop bar out of the path of its sensing lever.

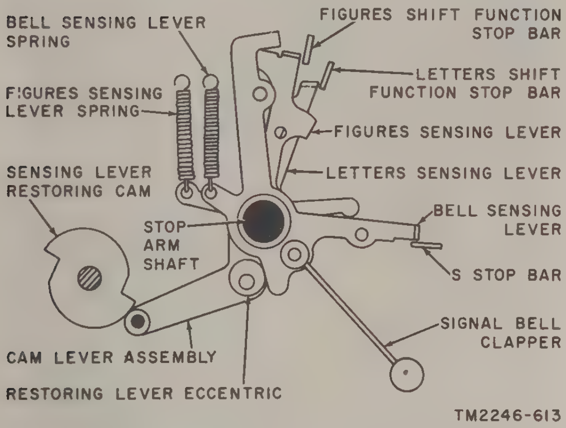
BELL SENSING LEVER SPRING
FIGURES SHIFT FUNCTION STOP BAR
LETTERS SHIFT FUNCTION STOP BAR
FIGURES SENSING LEVER SPRING
FIGURES SENSING LEVER
LETTERS SENSING LEVER
SENSING LEVER RESTORING CAM
STOP ARM SHAFT
BELL SENSING LEVER
S STOP BAR
SIGNAL BELL CLAPPER
CAM LEVER ASSEMBLY
RESTORING LEVER ECCENTRIC
TM2246-613

Figure 133. Function sensing levers in normal (blocked) position

106. Letters-Shift and Figures-Shift Operations

The type wheel of the perforator is moved to a forward position directly above the message tape for printing, and moved backward after printing to expose the printed character to view. This forward and rearward action of the type wheel is called type wheel reciprocation. The reciprocating mechanism moves the type wheel, and the figure-shift and letters-shift mechanism control the length of this type wheel reciprocating stroke.

a. Normal Reciprocation. Power to move the type wheel forward is supplied by the type wheel reciprocating cam on the receiving multisolenoid function shaft, which begins rotating after the transfer operation. As the type wheel reciprocating cam rotates, a high portion of the type wheel reciprocating cam (B, fig. 134) pushes one arm of the type wheel reciprocating cam follower downward. This action causes the opposite arm, coupled to the type reciprocating spring lever, to move upward and rotate the type wheel reciprocating spring lever clockwise as viewed from the rear. When the type wheel reciprocating spring lever rotates, it pivots the type wheel reciprocating transfer lever (A, fig. 134), thereby rotating the type wheel bell crank levers, and moving the type wheel forward above the message tape just before printing occurs. The inking ribbon assembly, mounted on the same support as the type wheel assembly, reciprocates forward with the type wheel. As the type wheel reciprocating cam continues to rotate after printing, a low portion of the type wheel reciprocating cam permits the shift cam follower spring to return the type wheel reciprocating cam follower to the original position. This action permits the type wheel to be returned by spring pressure to its normal rear position and exposes the printed character to view.

b. Letters-shift Operation. The raised characters and symbols which may be printed by this perforator are arranged in two parallel rows around the type wheel. The letters (outer) row contains the letters of the alphabet and three special symbols (LTRS column, fig. 51). The figures (inner) row contains the numerals, punctuation marks, and symbols shown in the FIGS column of figure 51. When the perforator is in the letters-shift position, the type wheel reciprocates forward just enough to move the letters row of characters to the printing position above the print hammer lever. When the unit is in the figures-shift position, the reciprocating stroke is longer, and the type wheel moves far enough forward to position the figures row above the print hammer lever. When a letters-shift code group is received, the code rings are positioned to select the letters stop bar. The letters sensing lever, no longer blocked by the letters-shift function stop bar, is rotated by the letters sensing

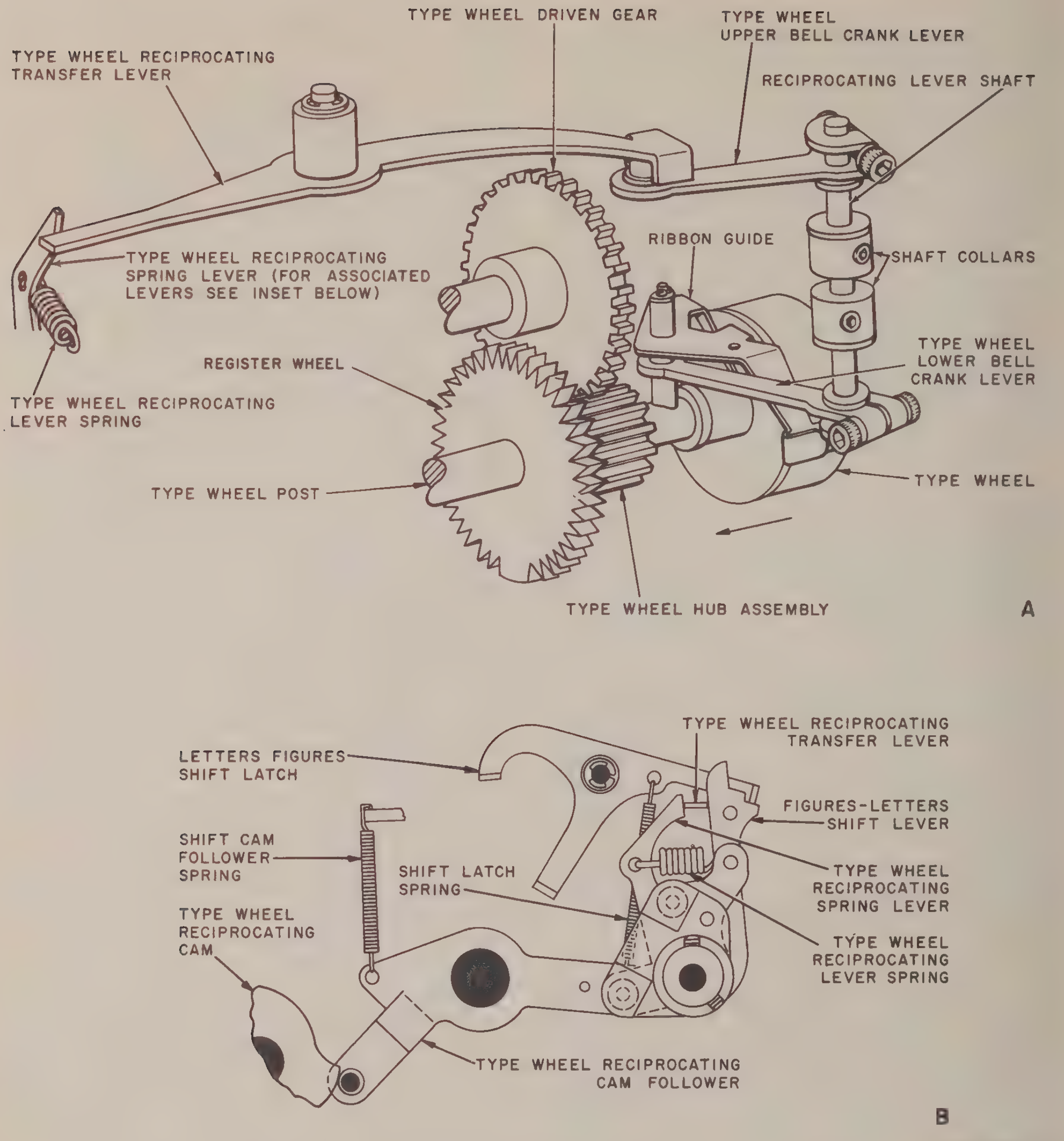
TYPE WHEEL DRIVEN GEAR
TYPE WHEEL UPPER BELL CRANK LEVER
TYPE WHEEL RECIPROCATING TRANSFER LEVER
RECIPROCATING LEVER SHAFT
RIBBON GUIDE
SHAFT COLLARS
TYPE WHEEL RECIPROCATING SPRING LEVER (FOR ASSOCIATED LEVERS SEE INSET BELOW)
TYPE WHEEL LOWER BELL CRANK LEVER
REGISTER WHEEL
TYPE WHEEL RECIPROCATING LEVER SPRING
TYPE WHEEL
TYPE WHEEL POST
TYPE WHEEL HUB ASSEMBLY
A
TYPE WHEEL RECIPROCATING TRANSFER LEVER
LETTERS FIGURES SHIFT LATCH
FIGURES-LETTERS SHIFT LEVER
SHIFT CAM FOLLOWER SPRING
SHIFT LATCH SPRING
TYPE WHEEL RECIPROCATING SPRING LEVER
TYPE WHEEL RECIPROCATING CAM
TYPE WHEEL RECIPROCATING LEVER SPRING
TYPE WHEEL RECIPROCATING CAM FOLLOWER
B

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Figure 134. Type wheel reciprocating and shifting mechanism.

lever spring. The arm opposite the spring engages the figures-letters shift lever (A, fig. 135) and rotates the figures-letters shift lever counterclockwise to the letters-shift position. This action permits the shift latch spring to pull the letters-figures shift latch downward, latching the figures-letters shift lever in the letters-shift position. In this position, the figures-letters shift lever limits the forward motion of the type wheel during reciprocation. The type wheel is moved forward during reciprocation, as the type wheel reciprocating spring lever rotates the free end of the type wheel reciprocating transfer lever. When the free end of the type wheel reciprocating transfer lever strikes the figures-letters shift lever, forward motion of the type wheel is halted, and the letters

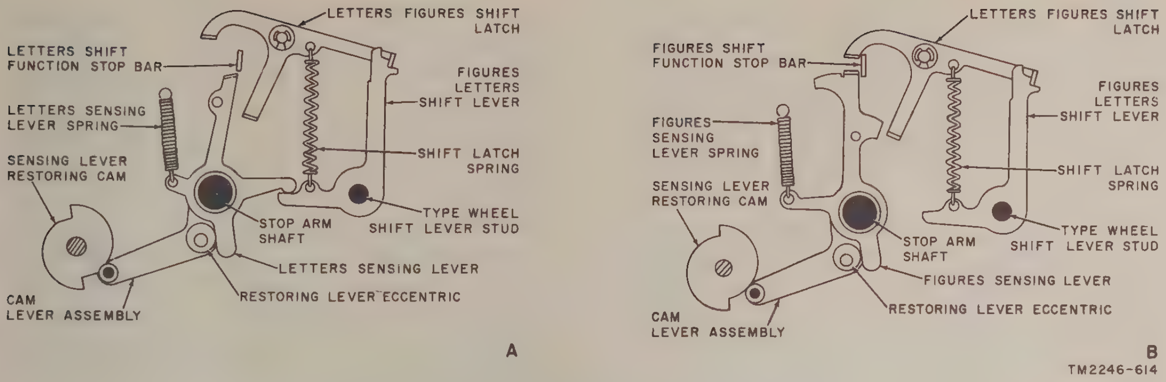

LETTERS FIGURES SHIFT LATCH
LETTERS SHIFT FUNCTION STOP BAR
FIGURES LETTERS SHIFT LEVER
LETTERS SENSING LEVER SPRING
SHIFT LATCH SPRING
SENSING LEVER RESTORING CAM
TYPE WHEEL SHIFT LEVER STUD
STOP ARM SHAFT
LETTERS SENSING LEVER
RESTORING LEVER ECCENTRIC
CAM LEVER ASSEMBLY
A
LETTERS FIGURES SHIFT LATCH
FIGURES SHIFT FUNCTION STOP BAR
FIGURES LETTERS SHIFT LEVER
FIGURES SENSING LEVER SPRING
SHIFT LATCH SPRING
SENSING LEVER RESTORING CAM
TYPE WHEEL SHIFT LEVER STUD
STOP ARM SHAFT
FIGURES SENSING LEVER
RESTORING LEVER ECCENTRIC
CAM LEVER ASSEMBLY
B
TM2246-614

Figure 135. Figures-shift and letters-shift mechanism.

row of characters is positioned directly above the print hammer lever.

c. Figures-shift Operation. Operation of the figure shift mechanism (B, fig. 135) results in a long forward stroke of the type wheel during reciprocation. Reception of the figures code group causes selection of the figures-shift function stop bar in the code-ring cage. Since the figures sensing lever is not blocked by its stop bar, the figures-sensing lever spring rotates the figures sensing lever and causes it to trip the letters figures shift latch. When tripped, the slight extension of the letters-figures shift latch moves upward and allows the figures-letters shift lever to be pulled to the figures shift position by the figures letters shift lever spring. In this position, the figures-letters shift lever extends the distance the type wheel reciprocating transfer lever moves during reciprocation, thereby increasing the forward motion of the type wheel. When the figures-letters shift lever is in the figures-shift position, forward motion of the type wheel is not halted until the figures (inner) row of the type wheel is directly over the print hammer lever. As operation of the perforator continues, the figures or symbols in this row are printed until a letters-shift code group is received.

107. Signal Bell Operation

This perforator includes a signal bell mechanism which is used by operators for signaling purposes. The signal bell rings each time the S-code group is received while the shift mechanism is in the figures-shift position. The code group also is recorded in punched form on the tape, and the bell symbol (fig. 51) is printed. Reception of the same code group causes the letter S to be printed when the shift mechanism is in the letters-shift position.

a. Operation. The signal bell mechanism (fig. 136) rings the bell whenever the bell sensing lever spring is permitted to rotate the bell sensing lever clockwise (as viewed from the rear), causing the signal bell clapper to strike the signal bell. The S-stop bar (used for the signal bell operation) normally blocks rotation of the bell sensing lever during operations other than ringing the signal bell (fig. 133). Reception of the S-code group causes the code rings to select the S-stop bar. The stop bar then moves out of the path of the bell sensing lever and permits the bell sensing lever to rotate when the unit is in the figures-shift position. The bell sensing lever moves the signal bell clapper against the signal bell. The mechanism is reset when the high part of the sensing lever restoring cam causes the cam lever assembly to restore the function sensing levers to the original counterclockwise position.

b. Signal Bell Suppression in Letters-shift Position. Although the same code group is used

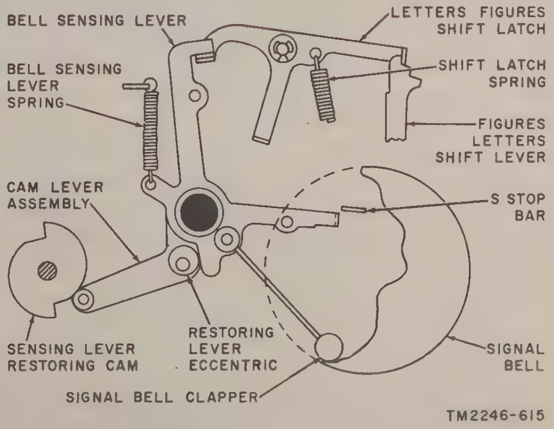

BELL SENSING LEVER
LETTERS FIGURES SHIFT LATCH
BELL SENSING LEVER SPRING
SHIFT LATCH SPRING
FIGURES LETTERS SHIFT LEVER
CAM LEVER ASSEMBLY
S STOP BAR
SENSING LEVER RESTORING CAM
RESTORING LEVER ECCENTRIC
SIGNAL BELL
SIGNAL BELL CLAPPER
TM2246-615

Figure 136. Signal bell mechanism in operated condition.

both for printing the letter S and ringing the signal bell, only one is accomplished when this code group is received. The upper extension of the bell sensing lever (fig. 136) is blocked by the upper arm of the letters-figures shift latch when the code group is received while the unit is in the letters-shift position. When this occurs, the perforator prints the letter S and punches the code in the message tape. If the code group is received while the perforator is in the figures-shift position, the upper arm of the letters-figures shift latch is positioned below the upper extension of the bell sensing lever and does not block rotation of the bells sensing lever. When this occurs, the signal bell rings, the signal bell code is punched in the message tape, and the type wheel reciprocates forward far enough to print the bell symbol (figures row) on the type wheel.

108. Rangefinder Mechanism

a. The function of the perforator rangefinder is identical with the function of the page printing mechanism rangefinder. For a complete description of rangefinder operation, see paragraph 78.

b. The mechanics of the perforator rangefinder are similar to the mechanics of the page printing mechanism rangefinder. The only difference is that the grooved pin on the perforator selector camshaft is moved directly by the rangefinder cam rather than having the operation transferred from a rangefinding cam through the orientation lever, as is the case with the page printing mechanism.

109. Receiving Simultaneous Signal Code by Perforator

a. Simultaneous signal code impulses sent from the simultaneous transmitter mechanism S15 of the keyboard transmitter are received by the perforator receiving multisolenoid. The receiving multisolenoid reacts to the simultaneous signals from the keyboard transmitter in the identical manner that it reacts to the simultaneous signals recieved from the code actuated switch (S32). Paragraphs 57 and 58 describe in detail the manner in which the 11-wire simultaneous circuits are originated by the keyboard transmitter.

b. When the receiving multisolenoid receives simultaneous signals from the code actuated switch (S32), the perforator latch coils (L3) are energized by the receiving multisolenoid pulsing contacts (S18) on the rear of the code actuated switch function shaft. When the perforator latch coils (L3) are energized, the recieving multisolenoid function shaft is allowed to rotate as described in paragraph 97*c*. When the receiving multisolenoid receives simultaneous signals from the keyboard transmitter, the perforator latch coils (L3) are energized through the contact of the keyboard counter (S12) if the keyboard control switch (S23) is in the KEYBD & TAPE position. The perforator latch coils (L3) are energized through the contact of keyboard reader S11 if the keyboard control switch (S23) is in the TAPE position.

c. When the perforator latch coils (L3) are energized, they allow the receiving multisolenoid function shaft to rotate. The perforator latch pulsing cam on the rear of the receiving multisolenoid function shaft operates the contacts of the perforator latch pulsing contacts (S20) (fig. 137). The normally open contact of the perforator latch pulsing contacts (S20) is closed by the action of the perforator latch pulsing cam and completes a circuit to the restoring solenoid (L1) on the keyboard transmitter. When the restoring solenoid (L1) is energized, it restores the cam stop lever (fig. 62), pivoting the cam stop lever and the switch actuating lever (fig. 67) on the back of the keyboard transmitter. This pivots the switch arm, opening the keyboard reader switch to the 11-wire simultaneous circuit. Before the receiving multisolenoid (S11) function shaft completes its one-half revolution, the perforator latch pulsing cam opens the perforator latch pulsing contacts (S20) to open the circuit to the restoring solenoid (L1) and closes the circuit to the perforator latch

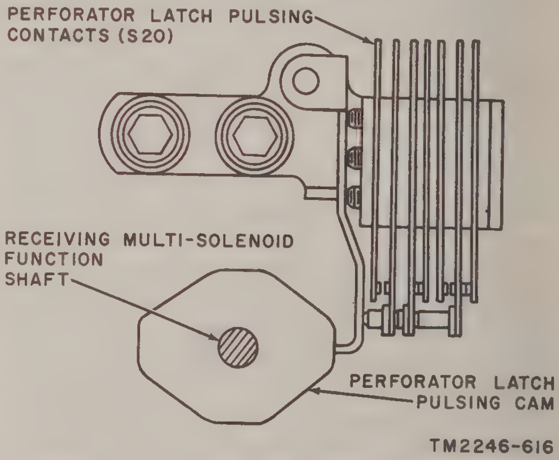

PERFORATOR LATCH PULSING CONTACTS (S20)
RECEIVING MULTI-SOLENOID FUNCTION SHAFT
PERFORATOR LATCH PULSING CAM
TM2246-616

Figure 137. Perforator latch pulsing contacts (S20) operating mechanism.

coils (L3). However, since the keyboard reader switch (S11) has been opened by the action of the restoring solenoid (L1), the circuit is not energized and the perforator latch solenoid does not operate. The receiving multisolenoid function shaft of the perforator rotates at the rate of 120 wpm and restores the restoring solenoid (L1) at that rate. Therefore it is possible to transmit from the keyboard transmitter to the perforator at a maximum rate of 120 wpm.

110. General

The circuitry of the teleprinters is divided into the following 12 circuit groups: page printer power circuit, page printer sequential signal circuits, page printer simultaneous signal circuits, page printer local dc circuits, page printer motor circuits, perforator power circuits, perforator sequential signal circuits, perforator simultaneous signal circuits, perforator local dc circuits, perforator motor circuits, and connecting circuits. Figures 138 through 163 are schematic diagrams of these teleprinter circuits. The wiring diagrams and a complete schematic diagram of the page printer and the perforator circuits are included at the rear of the manual.

111. Page Printer Ac Input

(fig. 138)

a. The ac input circuit provides the power for page printer motor B1 or B2 and copy lamps I 1 and I 2 as well as the power that is rectified by rectifier CR1 to power the motor stop relay E1 and selector magnet E2 bias winding circuits. POWER switch S4 controls the power input circuit. The circuit is protected by fuse F1 in the line leading to rectifier CR1.

b. The circuit begins with the upper pin of plug P1, through the contacts of POWER switch S4, through fuse F1, through shorting contacts B and C of J4. The ac motor and copy light circuits are in parallel with rectifier CR1, which supplies motor-stop relay E1 and selector magnet E2 bias windings and are both connected to shorting contact B of J4 and to POWER switch S4. The circuits may be traced from this point through the contacts of POWER switch S4 to the lower pin of plug P1.

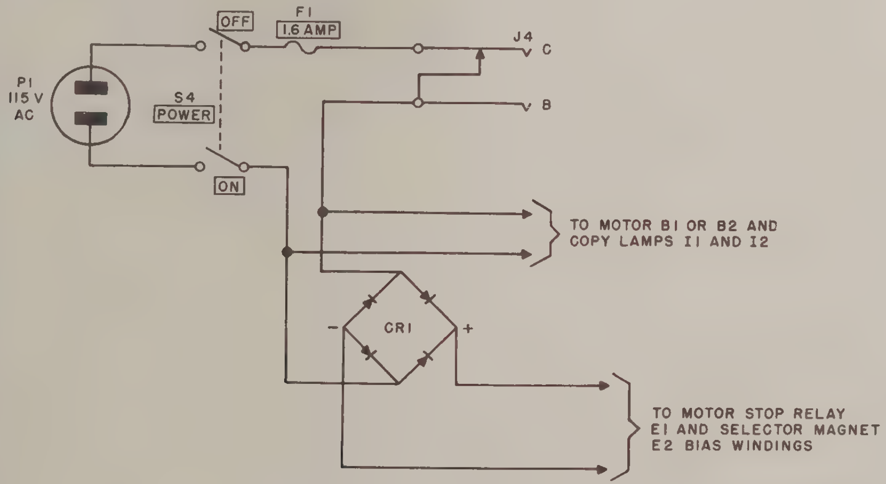


Figure 138. Page printer ac input, simplified schematic diagram.

Section IV. ELECTRICAL THEORY OF AN/FGC-25 (*)

112. Sequential Signal Circuits

a. Keyboard Transmitter Send Circuit (fig. 139).

(1) The page printer send circuit provides for neutral transmission from the keyboard transmitter of the page printer. Basically, it changes the mechanical movement of the code bars to electrical impulses. The circuit terminates in black SEND plug P21, which is normally connected to PRINTER SEND jack J21 on the perforator. SEND-LOCK switch S2 is provided for shorting the sequential transmitter mechanism E4 contacts when the page printer is to be used for receive

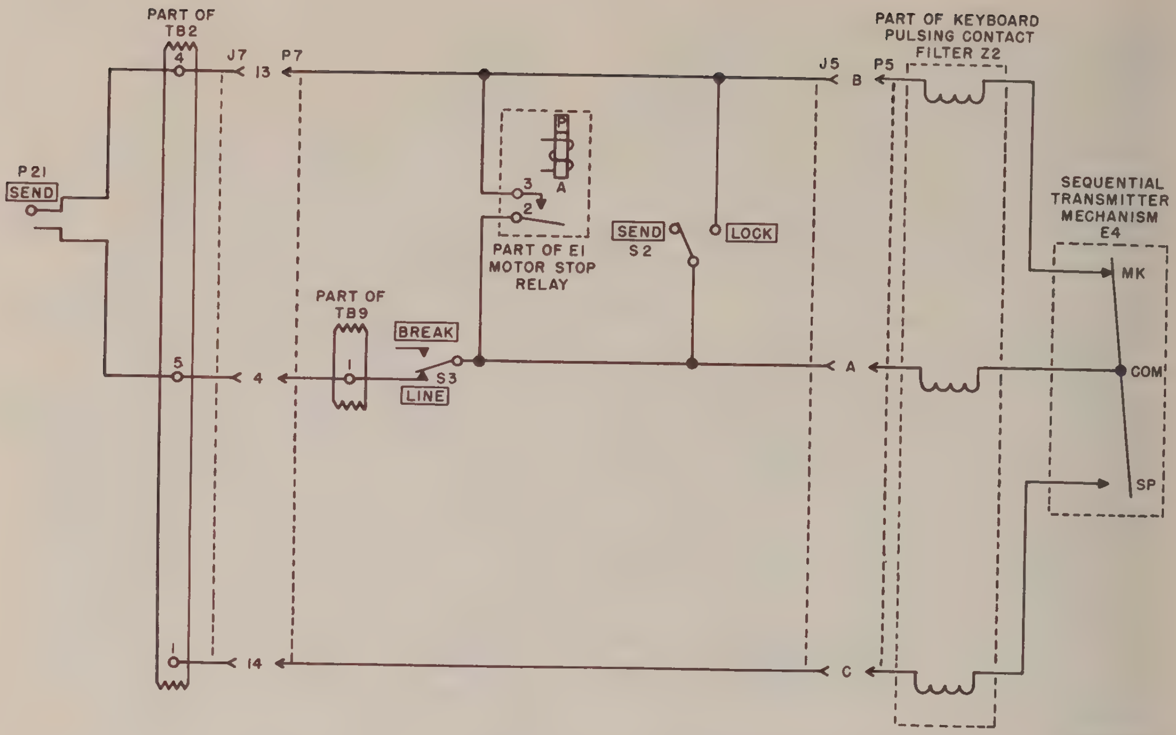

PART OF TB2
4
J7
P7
13
P21
SEND
5
4
1
14
PART OF TB9
1
BREAK
S3
LINE
3
2
A
PART OF E1 MOTOR STOP RELAY
SEND
S2
LOCK
J5
P5
B
A
C
PART OF KEYBOARD PULSING CONTACT FILTER Z2
SEQUENTIAL TRANSMITTER MECHANISM E4
MK
COM
SP
TM2246-278

Figure 139. Keyboard transmitter send circuit, simplified schematic diagram.

only. LINE-BREAK switch S3 makes it possible to open the line for signaling or breaking in on a message. A set of shorting contacts in motor stop relay E1 shorts sequential transmitter mechanism E4 contacts so that the line remains closed during the motor-stop function.

(2) With SEND LOCK switch S2 in the SEND position (open), LINE-BREAK switch S3 in the LINE position, motor-stop relay E1 in the nonoperated position, and sequential transmitter mechanism E4 in the MK position, the circuit may be traced from the tip of SEND plug P21, through terminal 4 of terminal board TB2, through terminal 13 of jack J7 and plug P7, through terminal B of jack J5 and plug P5, through keyboard pulsing contact filter Z2, to the MK contact of the sequential transmitter mechanism E4. The circuit continues through the mark contact, out the COM terminal of sequential transmitter mechanism E4, through the keyboard pulsing contact filter Z2, through terminal A of plug P5 and jack J5, to LINE-BREAK switch S3. The circuit is completed through the contacts of S3, to terminal 1 of terminal board TB9, through terminal 4 of plug P7 and jack J7 to terminal 5 of terminal board TB2 to the sleeve of SEND plug P21. When SEND-LOCK switch S2 is in the LOCK position, a short is placed across the contacts of motor-stop relay E1 and the MK and COM contacts of sequential transmitter E4. The circuit would then be traced from the tip of SEND plug P21 to terminal 4 of terminal board TB2, through terminal 13 of jack J7 and plug P7, through the contacts of SEND-LOCK switch S2 to LINE-BREAK switch S3. The circuit is completed through the contacts of LINE-BREAK switch S3 to terminal 1 of terminal board TB9, through terminal 4 of plug P7 and jack J7, to terminal 5 of terminal board TB2, to the sleeve of SEND plug P21. When motor-stop relay E1 is energized, the contacts connected to terminals 2 and 3 of motor-stop relay E1 are closed to provide a complete circuit regardless of the posi-

tion of sequential transmitter mechanism E4. This circuit may be traced from the tip of SEND plug P21, to terminal 4 of terminal board TB2, through terminal 13 of jack J7 and plug P7, to terminal 3 of motor-stop relay E1, through the contact and float to terminal 2 of motor-stop relay E1, to LINE-BREAK switch S3. The circuit is then completed through the contacts of LINE-BREAK switch S3 to terminal 1 of terminal board TB9, through terminal 4 of plug P7 and jack J7, to terminal 5 of terminal board TB2, to the sleeve of SEND plug P21. When LINE-BREAK switch S3 is in the BREAK position, the signal circuit of sequential transmitter mechanism E4 is open at that point.

b. Printer Receive Circuit (fig. 140). This circuit receives impulses from the signal line and controls selector magnet E2 which, in turn, governs the position of the mechanical parts within the selector mechanism. The printer receive circuit terminates in red REC plug P22, which is ordinarily placed in PRINTER RECEIVE jack J22 at the rear of the patch panel of Reperforator-Transmitter TT–179/FG. Either 20- or 60-ma signals may be used to operate selector magnet E2. SIGNAL switch S8 is provided to adapt the circuit to the level of the signal line current. This switch places the windings of selector magnet E2 in parallel for 60-ma operation and in series for 20-ma operation. Each of the SIGNAL switch S8 position settings is described separately in the following subparagraphs.

(1) *SIGNAL switch S8 in 20 position and motor-stop relay E1 in nonoperated position.* Beginning at the tip of red REC plug P22, follow the circuit through terminal 2 of terminal board TB2, to terminal 11 of terminal board TB3, to terminal 5 of plug P7 and J7, and then to terminal 4 of motor-stop relay E1. From terminal 4, the circuit may be traced to a contact of relay A, to a normally closed float, to terminal 5 of motor-stop relay E1, from terminal 5 to terminal A of jack 8 and plug 8. The circuit continues through the 4–1 line winding of selector magnet E2, through terminal B of plug P8 and jack J8, through terminal 10 of jack J7 and plug P7, to terminal 13 of terminal board TB3. With SIGNAL switch S8 in the 20 position, the circuit is traced through SIGNAL switch S8 to terminal 14 of terminal board TB3, to terminal 12 of plug P7 and jack J7, to terminal F of jack J8 and plug P8, through the 5–8 line winding of selector magnet E2 to

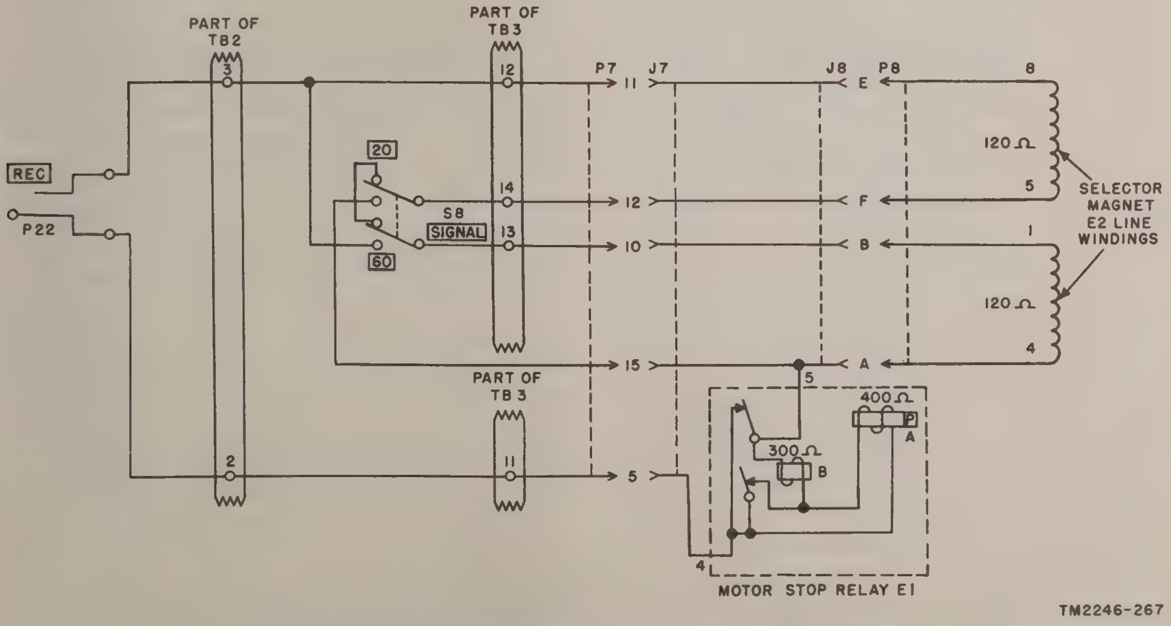


Figure 140. Page printer receive circuit, simplified schematic diagram.

terminal E of plug P8 and jack J8. The circuit is then completed by tracing through terminal 11 of jack J7 and plug P7, to terminal 12 of terminal board TB3, to terminal 3 of terminal board TB2, and to the sleeve of the red REC plug P22. With SIGNAL switch S8 in the 20 position, the line windings of selector magnet E2 are in series.

(2) *SIGNAL switch S8 in 60-ma position and motor-stop relay E1 in nonoperated position.* Beginning at the tip of red REC plug P22, the circuit remains the same as indicated in (1) above through the contacts to terminal 5 of motor-stop relay E1. At this point, the circuit divides. One path may be traced through terminal A of jack J8 and plug P8 through the 4–1 line winding of selector magnet E2, through terminal B of plug P8 and jack J8, to terminal 10 of jack J7 and plug P7, to terminal 13 of terminal board TB3. With SIGNAL switch S8 in the 60 position, the circuit continues through SIGNAL switch S8 to terminal 3 of terminal board TB2, and to the sleeve of red REC plug P22. The other path may be traced from motor-stop relay E1, terminal 5, through terminal 15 of jack J7 and plug P7, through the other contact of SIGNAL switch S8 to terminal 14 of terminal board TB3, through terminal 12 of plug P7 and jack J7, to terminal F of jack J8 and plug P8, through the 5–8 line winding of selector magnet E2 to terminal E of plug P8 and jack J8. The circuit continues through terminal 11 of jack J7 and plug P7, to terminal 12 of terminal board TB3, to terminal 3 of terminal board TB2 and to the sleeve of red REC plug P22. With SIGNAL switch S8 in the 60 position, note that the line windings of selector magnet E2 are connected in parallel.

c. Page Printer Selector Magnet Bias Circuit (fig. 141).

(1) This circuit supplies dc from rectifier CR1 to the bias windings of selector magnet E2. BIAS switch S7 is provided to control the current in the bias circuit for 20-ma or 60-ma (neutral) or polar operation of the line windings of selector magnet E2. When BIAS switch S7 is in the 60 position, 15 ma is supplied to the bias windings of selector magnet E2. When BIAS switch S7 is in the 20 position, 10 ma is supplied to the bias windings of selector magnet E2. When BIAS switch S7 is in the POLAR POLAL position, the bias circuit is disconnected and no current flows through the bias wingings. The circuit is protected by fuse F4. The bias windings are connected through variable resistor R4 which can be adjusted to control the current through the bias windings. A convenient strap arrangement is inserted in the circuit to provide a means of inserting a milliammeter to measure the current. In neutral operation, the bias circuit controls the movement of selector magnet E1 armature to the space position. In the polar or polal operation, the bias circuit is open and performs no function.

(2) The circuit is traced from the negative side of rectifier CR1, through fuse F4, through terminal D of jack J8 and plug P8, through the 2–3 bias windings of selector magnet E2, and through variable resistor R4. The circuit continues through the 7–6 bias winding of selector magnet E2, through terminal C of plug P8 and jack J8, through terminal 16 of jack J7 and plug P7, to terminal 10 of terminal board TB3. With BIAS switch S7 in the 20 position, the circuit is completed through resistor R9, through the 20 contact of BIAS switch S7, through resistor R8, through the negative to positive strap of the TEST BIAS MA 1 to terminal 9 of plug P7 and jack J7, to the positive side of rectifier CR1. If BIAS switch S7 is in the 60 position, the circuit is completed from terminal 10 of terminal board TB3, through the 60 contact of BIAS switch S7, through resistor R8, through the negative to positive strap of the TEST BIAS MA to terminal 9 of plug P7 and jack J7, to the positive side of the rectifier CR1. If BIAS switch S7 is in the POLAR position, the bias circuit is open at that point.

113. Page Printer Simultaneous Signal Circuit
(fig. 142)

a. When preparing tape locally at a maximum speed of 125 wpm, receiving multisolenoid E10

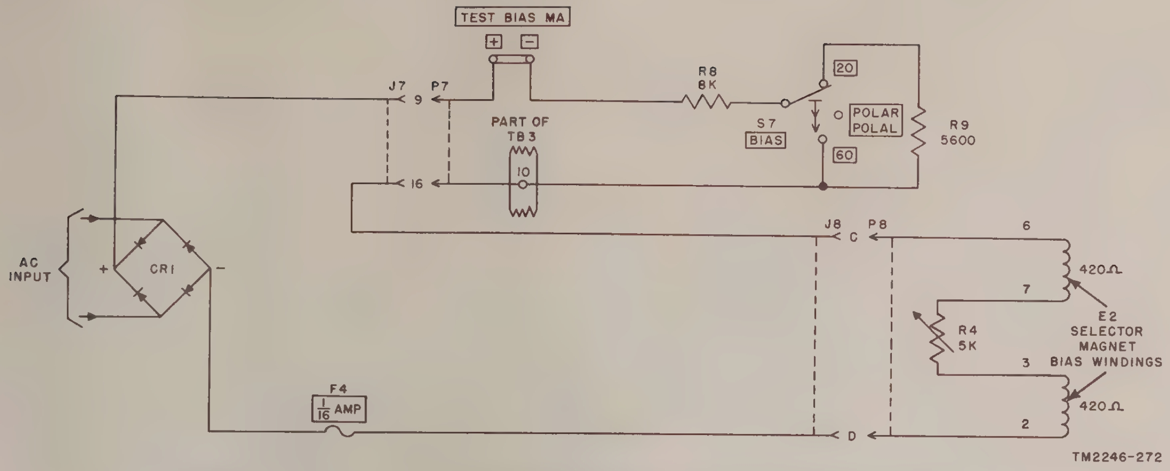
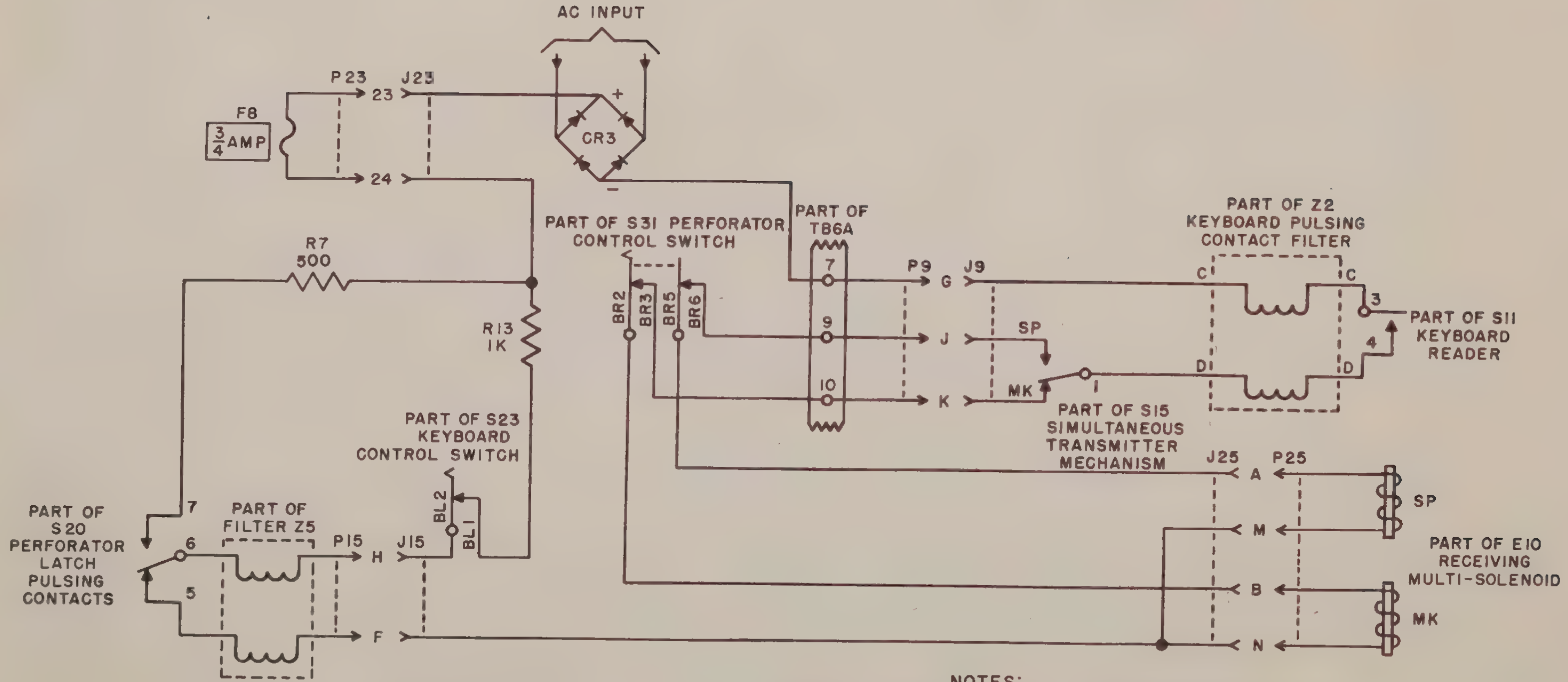


Figure 141. Page printer selector magnet E2 bias circuit, simplified schematic diagram.

receives simulatenous impusles directly from the simultaneous transmitter mechanism (S15). Keyboard control switch S23 must be in the KEYBD & TAPE or TAPE position and perforator control switch S31 in the KEYBD position. The depression of a key lever closes contacts 2 and 4 of keyboard reader switch S11 and moves five code bars which in turn set up simultaneous transmitter mechanism S15. The keyboard reader S11 and perforator latch pulsing contacts S20 complete the dc supply circuit from rectifier CR3 to receiving multisolenoid E10 for all five intelligence impluses simultaneously. Two coils are provided in the receiving multisolenoid for each impulse. If the MK coil is energized, it moves the associated multisolenoid Y-lever to the mark position. If the SP coil is energized, it moves the associated multisolenoid Y-lever to the space position. The circuit described in *b* below is for the first intelligence impulse and is typical of the other four impulses with the exception of the terminal numbers for TB6A, plug P9 and jack J9, plug P25 and jack J25, and the contacts of perforator control switch S31.

b. Beginning with the negative side of rectifier CR3, the circuit is traced through terminal 7 of terminal board TB6A, through terminal G of plug P9 and jack J9, through terminals C of keyboard pulsing contact filter Z2, through float 3 and contact 4 of the keyboard reader S11 and terminals D of keyboard pulsing contact filter Z2. If a code bar is in the marking position, the circuit continues through the MK contact of simultaneous transmitter mechanism S15, through terminal K of jack J9 and plug P9 to terminal 10 of terminal board TB6A, through the BR3 and BR2 contacts of perforator control switch S31, which is in the KEYBD position, through terminal B of jack J25 and plug P25, through the MK coil of receiving multisolenoid E10, through terminal N of plug P25 and jack J25. The circuiut continues through terminal F of jack J15 and plug P15, filter Z5, through the closed contacts and float 6 of perforator latch pulsing contacts S20, filter Z5, through terminal H of plug P15 and jack J15, through BL2 and BL1 contacts of keyboard control switch S23, which is in the KEYBD & TAPE or TAPE position, through resistor R13. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3. If a code bar is moved to the spacing position, the circuit continues from contact 4 of keyboard reader S11 through terminals D of keyboard pulsing contact filter Z2, through the SP contact of the simultaneous transmitter mechanism S15 to terminal J of jack J9 and plug P9, through terminal 9 of terminal board TB6A, through the BR6 and BR5 contacts of perforator control switch S31, which is in the KEYBD position, through terminal A of jack J25 and plug P25, through the SP coil of receiving multisolenoid E10, and through terminal M of plug P25 and jack J25. The circuit continues through terminal F of jack J15 and plug P15, filter Z5, through closed contact 5 and the float of the perforator latch pulsing contacts S20, filter Z5, through terminal H of plug P15 and jack J15 through the BL2 and BL1 contacts of keyboard

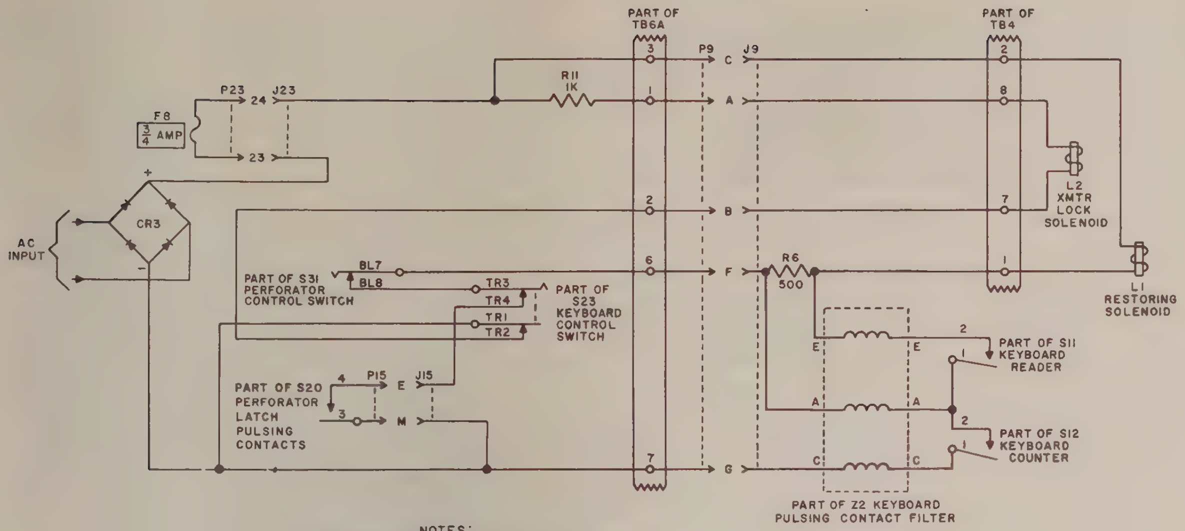

AC INPUT
CR3
+
−
F8
$\frac{3}{4}$AMP
P23
J23
23
24
R7
500
R13
1K
PART OF S31 PERFORATOR CONTROL SWITCH
BR2
BR3
BR5
BR6
PART OF TB6A
7
9
10
P9
J9
G
J
K
SP
MK
I
PART OF Z2 KEYBOARD PULSING CONTACT FILTER
C
C
D
D
3
4
PART OF S11 KEYBOARD READER
PART OF S15 SIMULTANEOUS TRANSMITTER MECHANISM
J25
P25
A
M
B
N
SP
MK
PART OF E10 RECEIVING MULTI-SOLENOID
PART OF S23 KEYBOARD CONTROL SWITCH
BL2
BL1
PART OF S20 PERFORATOR LATCH PULSING CONTACTS
7
6
5
PART OF FILTER Z5
P15
J15
H
F

NOTES:

1. S31 PERFORATOR CONTROL SWITCH IN KEYBD POSITION.
2. S23 KEYBOARD CONTROL SWITCH IN TAPE OR KEYBD & TAPE POSITION.
3. S15 SIMULTANEOUS TRANSMITTER MECHANISM IN MK, MARKING, POSITION.
4. S11 KEYBOARD READER SWITCH CAN BE CLOSED BY DEPRESSING A KEY LEVER.

TM2246-287

Figure 142. Keyboard simultaneous transmitter mechanism S15 to receiving multisolenoid E10 circuit, simplified schematic diagram.


PART OF TB6A
P9
J9
PART OF TB4
P23
J23
24
23
F8
$\frac{3}{4}$ AMP
R11
1K
+
-
CR3
AC INPUT
L2 XMTR LOCK SOLENOID
L1 RESTORING SOLENOID
C
A
B
F
G
R6
500
BL7
BL8
PART OF S31 PERFORATOR CONTROL SWITCH
TR3
TR4
TR1
TR2
PART OF S23 KEYBOARD CONTROL SWITCH
PART OF S20 PERFORATOR LATCH PULSING CONTACTS
P15
J15
E
M
4
3
PART OF S11 KEYBOARD READER
PART OF S12 KEYBOARD COUNTER
PART OF Z2 KEYBOARD PULSING CONTACT FILTER

NOTES:
1. S11 KEYBOARD READER SWITCH S11 CAN BE CLOSED BY DEPRESSING A KEY LEVER.
2. S23 KEYBOARD CONTROL SWITCH IS IN TAPE POSITION.
3. S31 PERFORATOR CONTROL SWITCH IS IN KEYBD POSITION.

TM2246-348

Figure 143. Restoring solenoid L1 and XMTR lock solenoid L2 circuits, simplified schematic diagram.

control switch S23, which is in the KEYBD & TAPE or TAPE position, through resistor R13. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23 to the positive side of rectifier CR3.

114. Local Dc Circuits

a. *Restoring Solenoid Circuit (fig. 143).*

(1) This circuit supplies dc from rectifier CR3 to energize restoring solenoid L1. The position of perforator control switch S31 and keyboard control switch S23 determines which set of contacts will close the circuit to energize restoring solenoid L1. When the keyboard control switch is in the KEYBD or KEYBD & TAPE position, keyboard counter contacts S12 close the circuit to energize restoring solenoid L1. If the keyboard control switch is in the TAPE position and perforator control switch S31 is in the KEYBD position, the keyboard reader contacts S11 and the perforator latch pulsing contacts S20 close the circuit to energize restoring solenoid L1. When the restoring solenoid L1 is energized, it restores the cam-stop lever to stop the XMTR camshaft and provides the power to rotate the line indicator drive shaft.

(2) When keyboard control switch S23 is in the KEYBD or KEYBD & TAPE position, the circuit is traced from the negative side of rectifier CR3 to terminal 7 of terminal board TB6A, through terminal G of plug P9 and jack J9, through terminals C of keyboard pulsing contact filter Z2, through the float 1 and contact 2 of keyboard counter S12, through resistor R6, to terminal 1 of terminal board TB4. The circuit continues through restoring solenoid L1, through terminal 2 of terminal board TB4, through terminal C of jack J9 and plug P9 to terminal 3 of terminal board TB6A. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8, through terminal 23 of plug P23, and jack J23, to the positive side of the rectifier CR3.

(3) When keyboard control switch S23 is in the TAPE position and perforator control switch S31 is in the KEYBD position, the circuit is traced from the negative side of rectifier CR3, through terminal M of jack J15 and plug P15, through float 3 and contact 4 of perforator latch

pulsing contacts S20, through terminal E of plug P15 and jack J15, through contact TR4 and float TR3 of keyboard control switch S23, through contact BL8 and float BL7 of the perforator control switch S31 to terminal 6 of terminal board TB6A, to F of plug P9 and jack J9 through terminal A of keyboard pulsing contact filter Z2, through float 1 and contact 2 of keyboard reader switch S11, through terminals E of keyboard pulsing contact filter Z2. The circuit continues through terminal 1 of terminal board TB4, through restoring solenoid L1 to terminal 2 of terminal board TB4. The circuit is completed through terminal C of jack J9 and plug P9, through terminal 3 of terminal board TB6A, through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3.

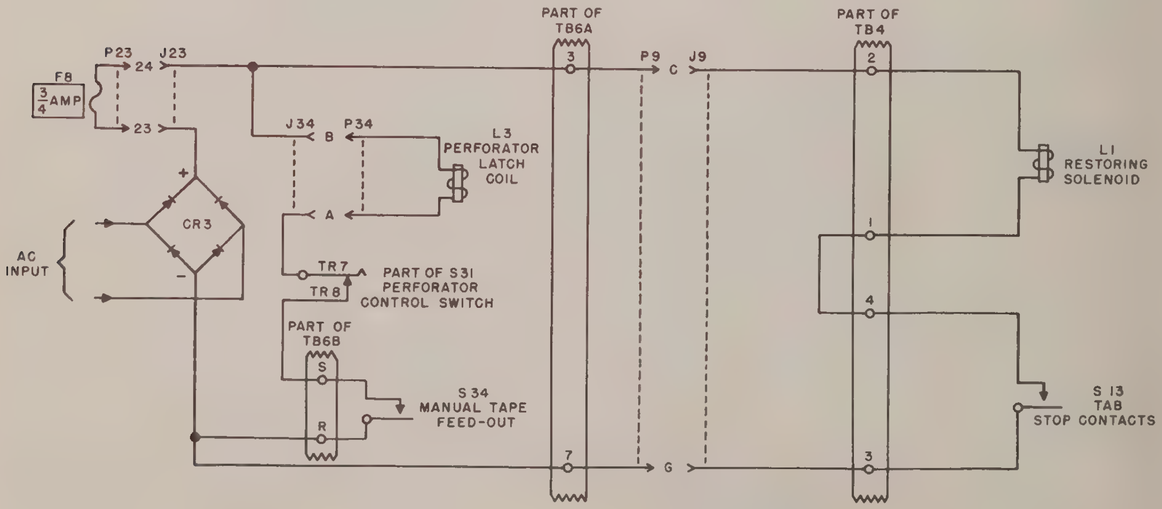
b. *Transmitter Lock Circuit* (fig. 143).

(1) This circuit supplies dc from rectifier CR3 to XMTR lock solenoid L2 when keyboard control switch S23 is in the TAPE position. When XMTR lock solenoid L2 is energized, it prevents the XMTR camshaft from rotating. This circuit is used when punching tape from the keyboard transmitter.

(2) When keyboard control switch S23 is in the TAPE position, the circuit is traced from the negative side of rectifier CR3 through float TR1 and contact TR2 of keyboard control switch S23, through terminal 2 of terminal board TB6A, through terminal B of plug P9 and jack J9 to terminal 7 of terminal board TB4. The circuit continues through XMTR lock solenoid L2, through terminal 8 of terminal board TB4, through A of plug P9 and jack J9, through terminal 1 of terminal board TB6A, through resistor R11 to terminal 24 of jack J23 and plug P23. The circuit is completed through fuse F8, through terminal 23 of plug P23 and jack J23 to the positive side of rectifier CR3.

c. *Tab Set Lever Circuit* (fig. 144).

(1) A tabulator mechanism is provided on the keyboard transmitter of the page printer. When a tab set lever is pulled down and the space bar and repeat key are depressed, the indicator carriage moves to the right until it strikes the actuated tab set lever. When the indicator carriage strikes the actuated tab set lever, tab stop contacts S13 are closed. holding restoring solenoid L1 energized. This restores the cam-stop lever and stops the rotation of the XMTR camshaft. The dc



NOTES:
1. S31 PERFORATOR CONTROL SWITCH IS IN REPERF POSITION.
2. S 34 MANUAL TAPE FEED-OUT CONTACT IS MANUALLY OPERATED.

TM2246-269

Figure 144. Tab set lever and manual tape feed-out circuit, simplified schematic diagram.

to energize restoring solenoid L1 is supplied from rectifier CR3.

(2) The tab set lever circuit is traced as follows: from the negative side of rectifier CR3 to terminal 7 of terminal board TB6A, through terminal G of plug P9 and jack J9 to terminal 3 of terminal board TB4. When tab stop contacts S13 are closed, the circuit continues through tab stop contacts S13 to terminal 4 of terminal board TB4, to terminal 1 of terminal board TB4, through the restoring solenoid L1 to terminal 2 of terminal board TB4, through terminal C of jack J9 and plug P9, to terminal 3 of terminal board TB6A, through terminal 24 of jack J23 and plug P23, through fuse F8, through terminal 23 of plug P23 and jack J23 to the positive side of rectifier CR3.

d. Motor-Stop Circuit (fig. 145).

(1) Motor-stop relay E1 is a sealed relay consisting of relays A and B. The bottom view of this relay is shown in A, figure 145.

(2) In the normal operating condition, capacitors C5 and C6 are charged from rectifier CR1 when float 2 of motor-stop contacts S1 was against contact 3. The motor-stop function is an electromechanical function which is actuated by pressing the H key lever when the page printer is in the FIGS position (par. 65*c*). This causes the function selecting arm to be positioned in line with the motor-stop punch bar. The function cam then causes the function selecting arm to be moved inward, striking the motor-stop punch bar. As the punch bar moves inward, it pivots the motor-stop function lever. The motor-stop function lever strikes an insulator on float 2 of motor-stop contacts S1, and moves it from contact 3 to contact 1 momentarily. The float making contact with contact 1 closes a circuit, allowing capacitors C5 and C6 to discharge through the 37-ohm operating winding of relay A.

(3) The discharge path of capacitors C5 and C6 is as follows: from the negative side of capacitors C5 and C6 to terminal C of jack J2 and plug P2, through float 2 and contact 1 of motor-stop contacts S1 to terminal A of plug P2 and jack J2, to terminal 1 of motor-stop relay E1, through the 37-ohm operating winding of relay A to terminal 6 of motor-stop relay E1, and back to the positive side of capacitors C5 and C6. Relay A of motor-stop relay E1 is composed of a 37-ohm operating winding, a 400-ohm release winding, and a permanent magnet. The permanent magnet is not strong enough to pull the contacts to it without the operating winding being energized. However, once the contacts have been operated, the permanent magnet, by itself, is capable of holding them there. Capacitors C5 and C6, discharging through the operating winding of relay A, aid the permanent magnet and operate the contacts. When this happens, the set of contacts connected to terminals 2 and 3 (of terminals 1–4) of motor-stop relay E1, which are connected in series to the motor circuit, opens. This causes the motor to stop. A second set of contacts connected to terminals 2 and 3 (of terminals 1–6) of E1 closes. These contacts, connected in parallel across sequential transmitter mechanism E4, short E4 and keep current on the line regardless of the position of sequential transmitter mechanism E4. A third set of contacts, connected to terminals 4 and 5 of motor stop relay E1 and in series with the page printer receive circuit, open. This makes the current in the page printer receive circuit pass through the winding of relay B and the release winding of relay A momentarily. Relay B then becomes energized, closing its contact. When this happens the receive current continues to flow through the winding of relay B, but now bypasses the release winding of relay A, through the closed contacts of relay B. Although the release winding of relay A opposes the permanent magnet, the contacts of relay A remain operated during the time receive current is passing through the release winding because during this time, current is still present in the operating winding. The electromagnetic force of the release winding is in opposition to the force of the operating winding, and the permanent magnet holds the con-

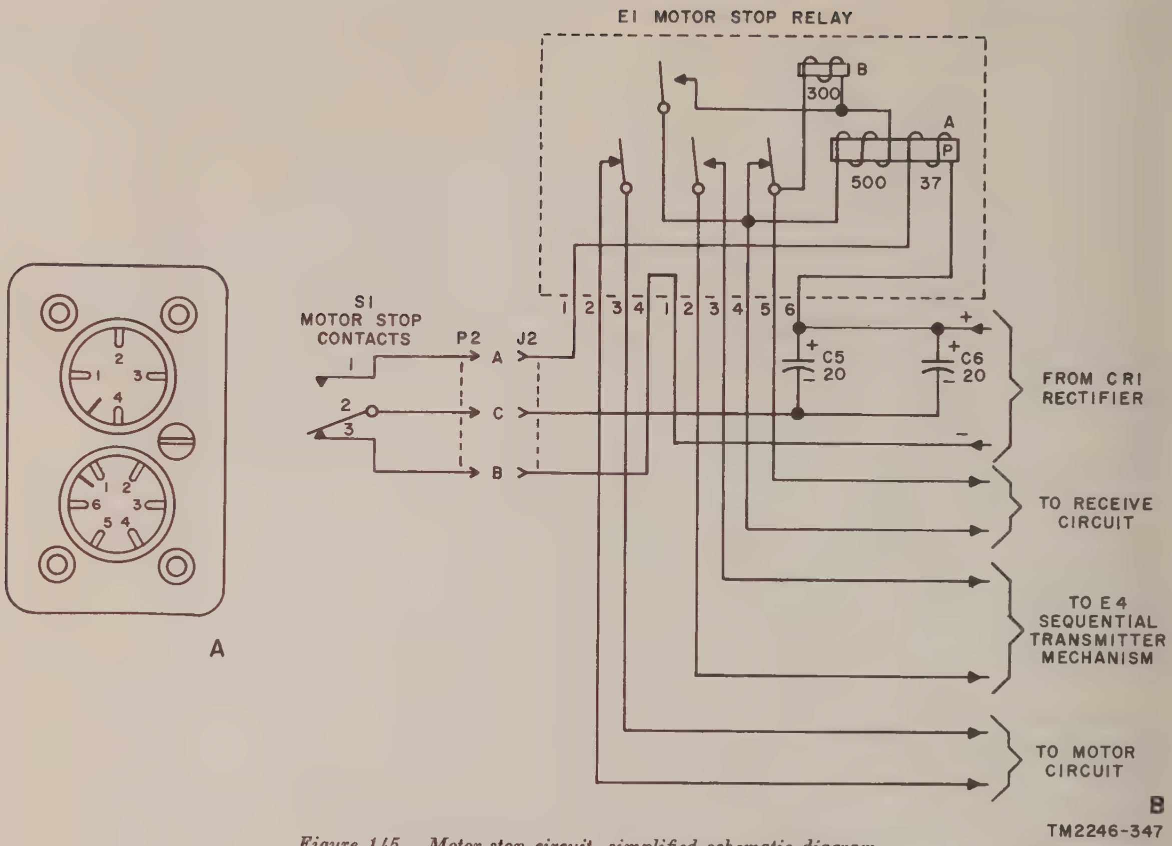
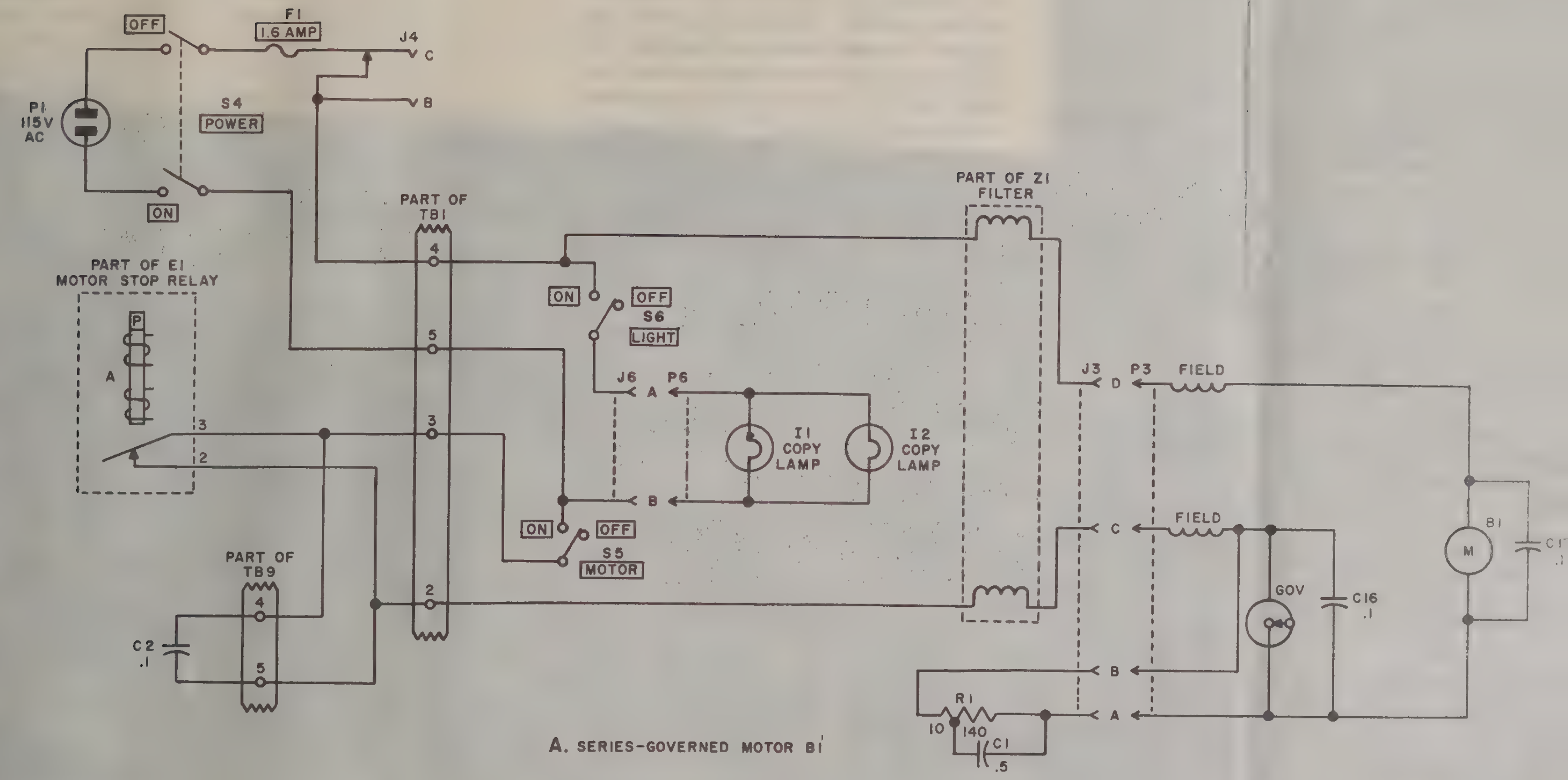


Figure 145. Motor-stop circuit, simplified schematic diagram.

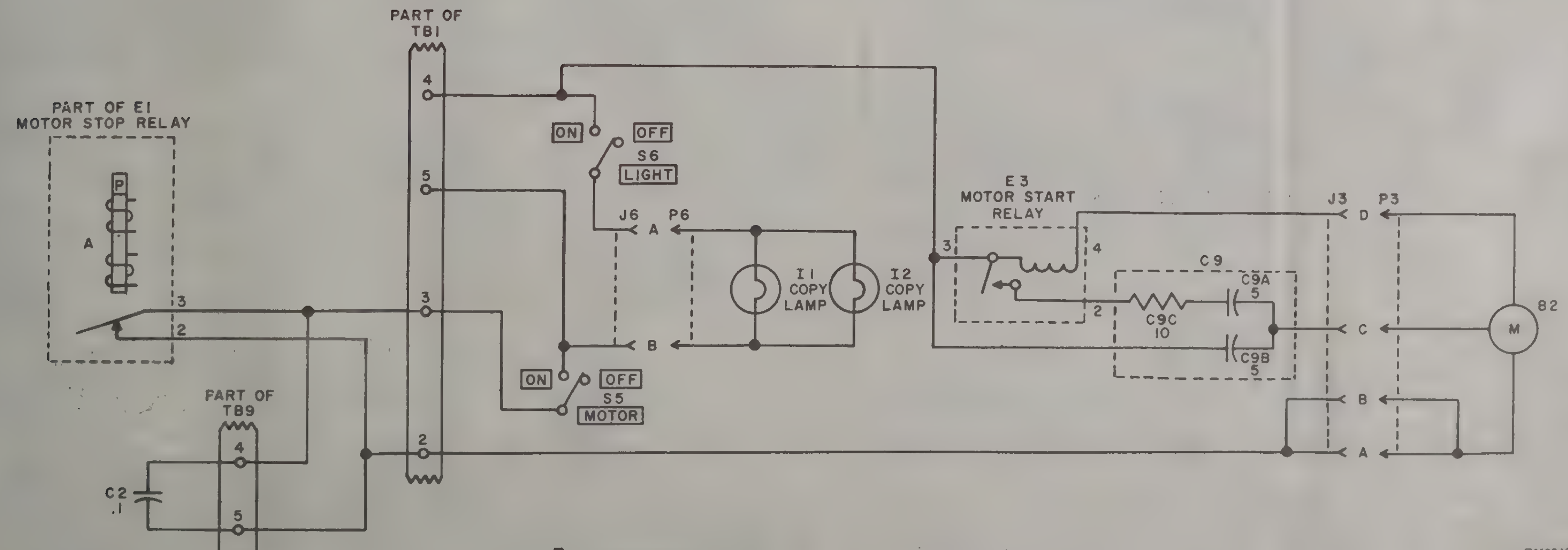
tacts in the operated condition. The motor-stop function is completed when the motor-stop function lever allows float 2 of the motor-stop contacts S1 to return to contact 3, which opens the circuit through the operating winding of relay A and allows capacitors C5 and C6 to be recharged. The receive current continues to flow through relay B. To start the motor, the contacts of relay A must be released to their normal position. This is accomplished when LINE-BREAK switch S3 is moved to the BREAK position. The receive circuit through the winding of relay B is then opened, causing the contacts of relay B to open. When LINE-BREAK switch S3 is released, it automatically returns to the LINE position, allowing current to flow through the line. The receive current now passes through the winding relay B and also through the release winding of relay A. This causes the contacts of relay A to release to their normal position. When this occurs, the first set of contacts closes, completing the motor circuit and starting the motor. The second set of contacts opens removing the short across sequential transmitter mechanism E4. The third set of contacts closes, allowing the receive current to be shorted across the winding of relay B and the release winding of relay A.

115. Ac Circuits

a. Page Printer Motor and Copy Lamp Circuits (fig. 146). Motor and copy lamp circuits of the page printer operate on 115 volts, 50 to 60 cycles ac supplied through plug P1, which is normally connected to a 115-volt convenience outlet (J16A or J16B) on the perforator. The ac for copy lamps I 1 and I 2 circuits is controlled by LIGHT switch S6. The ac for motor B1 or B2 circuit is controlled by MOTOR switch S5. The AN/FGC–25 is equipped with synchronous motor B2, and



A. SERIES-GOVERNED MOTOR B1



B. SYNCHRONOUS MOTOR B2

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Figure 146. Page printer motor and copy lamps circuits, simplified schematic diagram.

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the AN/FGC–25X is equipped with series-governed motor B1. Motors B1 and B2 circuits and the copy lamps I 1 and I 2 circuits are described in (1) through (3) below. The ac circuit supplies the power to motor B1 or B2 to operate the page printer. The ac circuit to copy lamps I 1 and I 2 lights the lamps to illuminate the copy for the teleprinter operator.

(1) *Copy lamp circuits.* The circuit may be traced from the upper pin of plug P1 through the contacts of POWER switch S4, through fuse F1, through the C–B shorting contacts of J4, to terminal 4 of terminal board TB1. Through LIGHT switch S6 to terminal A of jack J6 and plug P6, through copy lamps I 1 and I 2 which are in parallel, through terminal B of plug P6 and jack J6. The circuit is completed through terminal 5 of terminal board TB1, through the contacts of POWER switch S4, to the lower pin of plug P1.

(2) *Series-governed motor B1 circuit* (A, fig. 146). The circuit begins at the upper pin of plug P1, through POWER switch S4, through fuse F1, through the C–B shorting contacts of J4 to terminal 4 of terminal board TB1, through filter Z1, through terminal D of jack J3 and plug P3, through one of the field windings of series-governed motor B1, through the armature, through the governor contacts, through the other field winding, through terminal C of plug P3 and jack J3. The circuit continues through filter Z1, through terminal 2 of terminal board TB1, through the normally closed contacts 2 and 3 of motor-stop relay E1, through terminal 3 of terminal board TB1. The circuit is completed through MOTOR switch S5, through terminal 5 of terminal board TB1, through the contacts of POWER switch S4 to the lower pin of plug P1. When series-governed motor B1 reaches the proper speed, centrifugal force overcomes the pull of the movable electrical contact spring, and the governor contacts open. The circuit is traced from terminal D of plug P3 through one of the field windings of series-governed motor B1, through the armature, through terminal A of plug P3 and jack J3, through resistor R1 to terminal B of jack J3 and plug P3, through the other field winding to terminal C of plug P3 and jack J3. Adding resistor R1 reduces the current flowing through the field windings and the motor speed decreases until governor contacts close and short R1. The current through the motor increases until the governor contacts again open. This procedure continues as long as series-governed motor B1 is running. Series-governed motor B1 is electrically suppressed from rf interference by capacitors C1, C16, C17, and filter Z1. Capacitor C2 is provided to suppress the rf interference caused by operation of contacts 2 and 3 of motor-stop relay E1.

(3) *Synchronous Motor B2 Circuit.* The circuit begins at the upper pin of plug P1, through the contacts of POWER switch S4, through fuse F1, through the C–B shorting contacts of J45, through terminal 4 of terminal board TB1, to terminal 3 of motor-start relay E3. At this point the circuit divides. One path is traced through the winding of motor-start relay E3, through terminal D of jack J3 and plug P3, through motor B2, through terminal A of plug P3 and jack J3. The second path is traced through capacitor C9B, through terminal C of jack J3 and plug P3, through motor B2 through terminal B of plug P3 and jack J3. At this point the two paths join and the circuit is continued through terminal 2 of terminal board TB1, to motor-stop relay E1, through contact 2 and float 3 of motor-stop relay E1, to terminal 3 of terminal Board TB1, through MOTOR switch S5, to terminal 5 of terminal board TB1, through the contacts of POWER switch S4 to the lower pin of plug P1. When MOTOR switch S5 is first turned on, a surge of current passes through the winding of motor-start relay E3, causing the relay to operate. When motor-start relay E3 is operated, it places capacitor C9B in parallel with capacitor C9A and resistor C9C. This shifts the phase of the current giving the additional torque necessary to rotate the motor armature, building up its speed rapidly. Once the motor has reached its proper speed

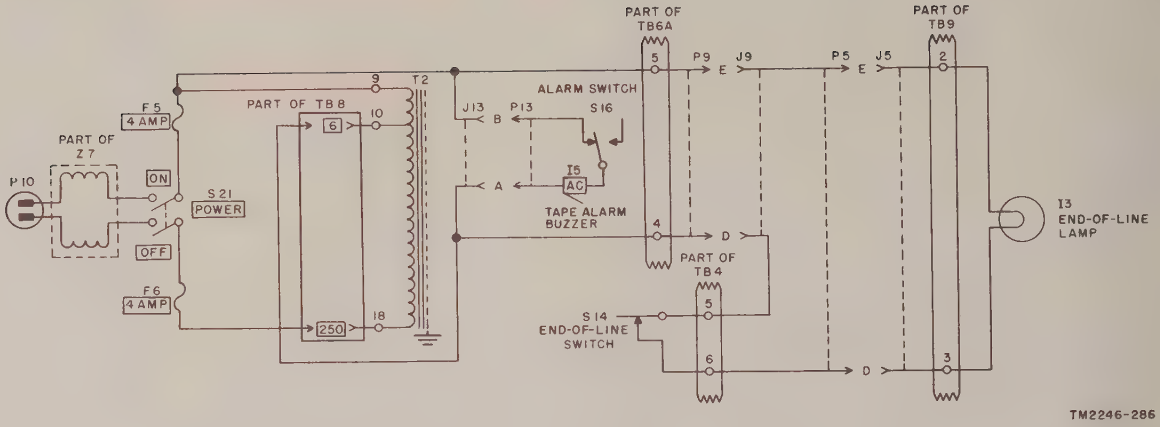


Figure 147. End-of-line and tape-out alarm circuits, simplified schematic diagram.

(3,600 rpm) the current passing through the winding of motor-start relay E3 decreases to a value that allows motor-start relay E3 to release. The current through the starting winding of synchronous motor B2 is reduced because it now passes only through capacitor C9B. Capacitor C9A and resistor C9C are disconnected from the circuit when motor-start relay E3 is released. Capacitor C2 is provided to suppress the rf interference caused by operation of contacts 2 and 3 of motor-stop relay E1.

b. End-of-line Circuit (fig. 147).

(1) This circuit supplies 6.3 volts ac to the end-of-line lamp I 3, located on the right side of the keyboard guard of the page printer. When transmitting from the keyboard transmitter, the end-of-line lamp lights to indicate that 66 characters have been transmitted since the last carriage return signal. The operator should punch the carriage return and line feed symbols in the message tape. The 6.3 volts ac to operate this circuit is obtained from the primary winding of transformer T2.

(2) The circuit begins with terminal 10 of transformer T2 to terminal 6 of terminal board TB8 to terminal 4 of terminal board TB6A, through terminal D of plug P9 and jack J9, through terminal 5 of terminal board TB4, through the closed end of line contacts S14, to terminal 6 of terminal board TB4. The circuit continues through terminal D of plug P5 and jack J5, through terminal 3 of terminal board TB9, through end of line lamp I 3, through terminal 2 of terminal board TB9, and through terminal E of jack J5 and plug P5. The circuit is completed through terminal E of jack J9 and plug P9, and through terminal 5 of terminal board TB6A to terminal 9 of transformer T2.

116. Perforator Power Circuits

a. Perforator Ac Input Circuit (fig. 148).

(1) The primary winding of transformer T2 is adjustable from 95 to 250 volts, 50 to 60 cycles ac. For example, if the input voltage were 125 volts ac, the adjustable tap would be plugged into the jack labeled 125. Whenever the adjustable tap corresponds to the input voltage, 115 volts ac will always be supplied to motor B1 or B2, copy lamp I 3, and convenience outlets J16A and J16B circuits. The transformer action of the primary winding steps up or steps down the voltage so that this is always true. POWER switch S21 is provided to control the ac to the primary winding of transformer T2. The ac input circuit is protected by two 4 AMP fuses F5 and F6.

(2) The circuit may be traced from the upper pin of plug P10, through filter Z7, through the contacts of POWER switch S21, through 4 AMP fuse F5, through terminal 9 of the primary winding of transformer T2 to the adjustable tap. The circuit can then be completed

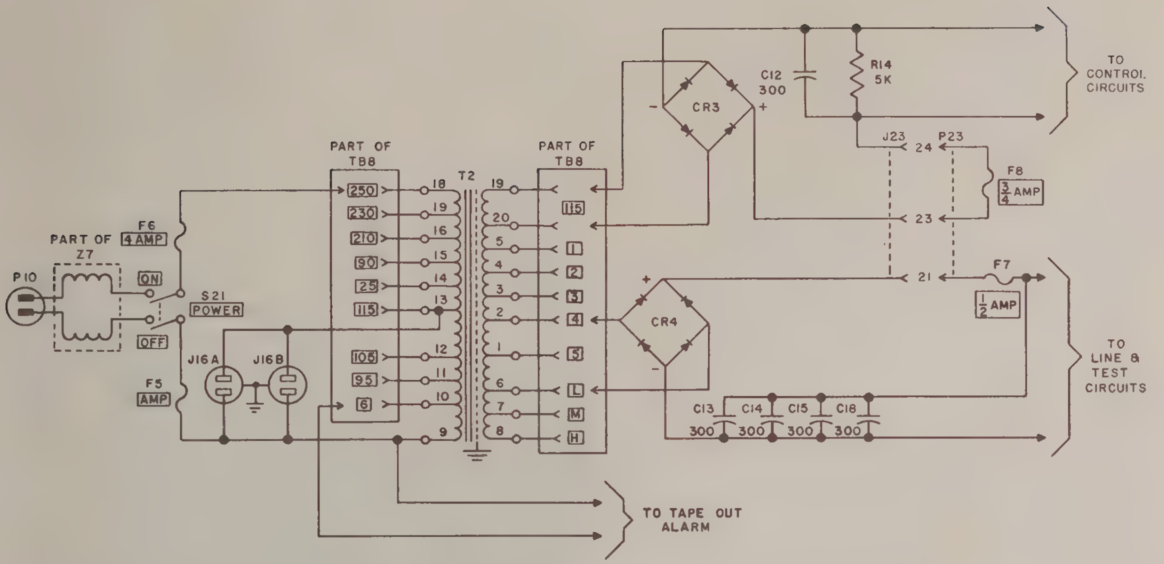


Figure 148. Perforator ac input and power supply circuits, simplified schematic diagram.

through 4 AMP fuse F6, through the other side of POWER switch S21, through filter Z7, to the lower pin of plug P10. Connected in parallel with the 115-volt tap are two convenience outlets (J16A and J16B).

b. Perforator Power Supply Circuit. The ac from the primary winding of transformer T2 (fig. 148) is induced into the secondary winding, and from there reapplied to the ac terminals of rectifiers CR3 and CR4. Rectifier CR4 supplies ac for the line and test circuits. The ac input to rectifier CR4 is adjustable by means of coarse jacks L, M, and H and fine jacks 1–5 of terminal board TB8 and the secondary winding coarse and fine adjustment plugs from CR4 (fig. 16). The output of rectifier CR4 (fig. 148) is filtered by capacitors C13, C14, C15, and C18 and is protected by one-half AMP fuse F7. The output of rectifier CR3 is filtered by capacitor C12 and protected by fuse F8. The ac input to rectifier CR3 is fixed. Resistor R14 acts as a bleeder resistor to maintain a consistent load on rectifier CR3 and also reduces the shock hazard. The output of rectifier CR3 supplies dc to the local control circuits.

117. Perforator Sequential Circuits

a. Transmitter-Distributor Send Circuit (fig. 149).

(1) This circuit is the signal line portion of the transmitter-distributor. The transmitter-distributor translates the mechanical sensing of the code perforations in message tape into a series of electrical impulses. This is accomplished by the mechanical control and operation of transmitter contact bail shown in figure 115. When transmitter contact bail is pivoted, it makes and breaks the circuit. The transmitter-distributor send circuit becomes part of a larger circuit when the transmitter-distributor has been placed in series with a signal line, marked TAPE DIST., through plug P37 and jack J37.

(2) The circuit may be traced from plug P37 to terminal 12 of plug P23 and jack J23, through terminal B of jack J14 and plug P14, to terminal 2 of terminal board TB5, and then through electrical noise suppressor Z3 to the COM terminal of transmitter-distributor transmitter contacts. Following through the transmitter contact bail and MK stationary contact, through electrical noise suppressor Z3 to terminal 1 of terminal board TB5, the circuit is completed by passing through terminal A of plug P14 and jack J14, through terminal 11 of jack J23 and plug P23 to jack J37.

b. Perforator Receive Circuit (fig. 150). This circuit terminates on plug P38 and jack J38,

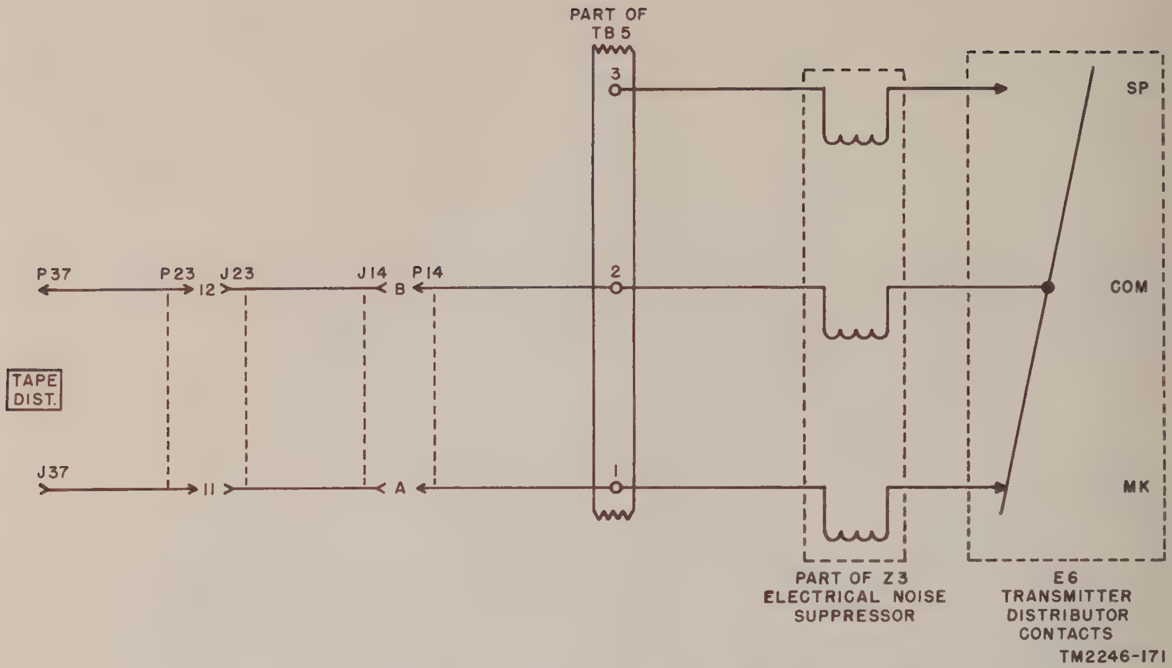


Figure 149. Transmitter-distributor send circuit, simplified schematic diagram

labeled REPERF. This makes it possible to connect it in series to any other circuit on the patch panel. This circuit provides a path for coded impulses to pass through the line windings of the selector magnet. Selector magnet E9 changes these coded impulses into a mechanical movement, which through a train of other mechanical operation, eventually results in a character being punched and printed on the message tape. SIGNAL switch S29 is provided to change the line windings of the selector magnet for 20-ma or 60-ma operation. When SIGNAL switch S29 is in the 20 position, selector magnet E9 line windings are connected in series with plug P38 and jack J38. When SIGNAL switch S29 is in the 60 position, selector magnet E9 line windings are connected in parallel with plug P38 and jack J38. Each of the switch position settings is described separately in the following subparagraphs.

(1) *SIGNAL switch S29 in 20-ma position.* The circuit may be traced beginning at plug P38 on the patch panel, through

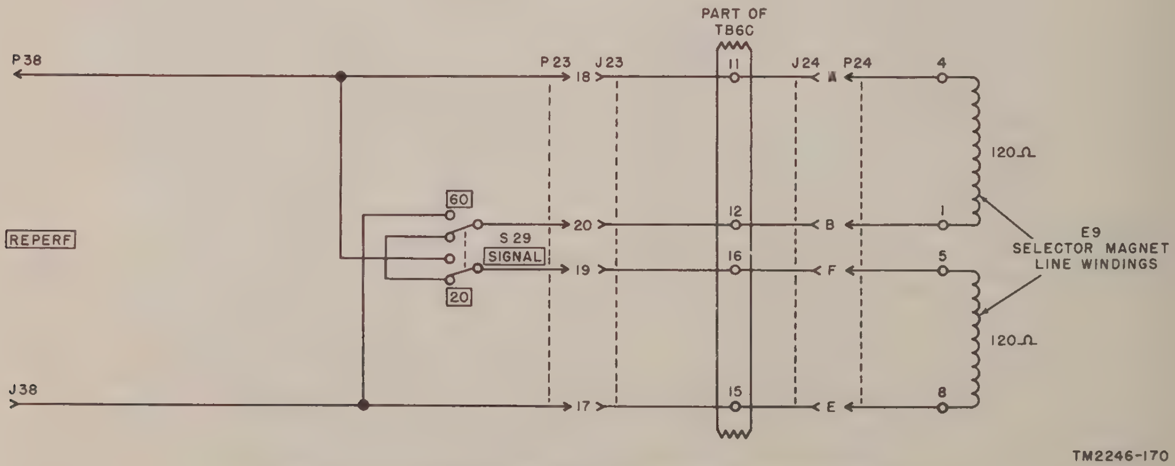


Figure 150. Perforator receive circuit, simplified schematic diagram.

terminal 18 of plug P23 and jack J23 to terminal 11 of terminal board TB6C, through terminal A of jack J24 and plug P24, through the 4–1 line winding of selector magnet E9, through terminal B of plug P24 and jack J24. The circuit continues through terminal 12 of terminal board TB6C, through terminal 20 of jack J23 and plug P23, through the contacts of SIGNAL switch S29 which is in the 20 position, to terminal 19 of plug P23 and jack J23. The circuit continues through terminal 16 of terminal board TB6C, through terminal F of jack J24 and plug P24, through the 5–8 line winding of selector magnet E9, to terminal E of plug P24 and jack J24. The circuit is completed through terminal 15 of terminal board TB6C, through terminal 17 of jack J23 and plug P23, to jack J38 on the patch panel. At this time, the selector magnet E9 line windings are connected in series.

(2) *SIGNAL switch S29 in 60-ma position.* Beginning at plug P38 on the patch panel, the circuit divides. One path is traced through terminal 18 of plug P23 and jack J23, through terminal 11 of terminal board TB6C, through terminal A of jack J24 and plug P24, through the 4–1 line winding of selector magnet E9. The circuit continues through terminal B of plug P24 and jack J24 to terminal 12 of terminal board TB6C, through terminal 20 of jack J23 and plug P23. With SIGNAL switch S29 in the 60 position, the circuit is completed through the contacts of SIGNAL switch S29 to jack J38 on the patch panel. The other path is traced from plug P38 through the contacts of SIGNAL switch S29 which is in the 60 position, to terminal 19 of plug P23 and jack J23, to terminal 16 of terminal board TB6C. The circuit continues through terminal F of jack J24 and plug P24, through the 5–8 line winding of selector magnet E9, through terminal E of plug P24 and jack J24, to terminal 15 of terminal board TB6C, through terminal 17 of jack J23 and plug P23, to jack J38 on the patch panel. At this time, selector magnet E9 line windings are connected in parallel.

c. Perforator Selector-Magnet Bias Circuit (fig. 151).

(1) This circuit supplies dc from rectifier CR4 to the bias windings of selector magnet E9. BIAS switch S30 is provided on the back of the perforator to set up the current in the bias circuit for 20-ma or 60-ma (neutral) or polar operation of selector magnet E9 bias windings. The bias windings of selector magnet E9 move selector magnet E9 armature to the space position in neutral operation when there is no line current. When BIAS switch S30 is in the 20-ma position, 10-ma is supplied to selector magnet E9 bias windings. When the switch is in the 60-ma position, 15-ma is supplied to the selector magnet bias windings. When BIAS switch S30 is in the POLAR position, the bias circuit is disconnected. A convenient method of inserting a milli-

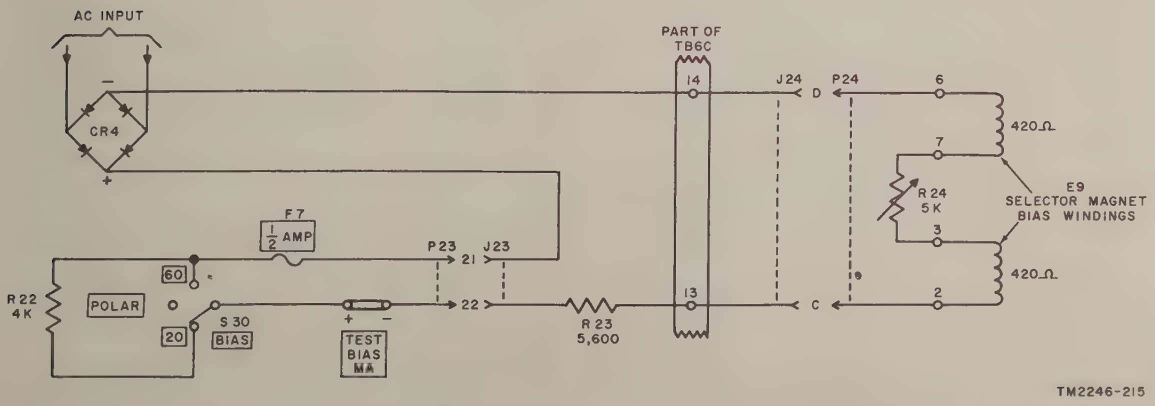


Figure 151. Perforator selector magnet bias circuit, simplified schematic diagram.

ammeter in the circuit to measure the current flow is provided with a negative to positive TEST BIAS MA.

(2) The circuit may be traced from the negative side of rectifier CR4 to terminal 14 of terminal board TB6C, through terminal D of jack J24 and plug P24, through the 6–7 bias windings of selector magnet E9, through variable resistor R24. The circuit then continues through the 3–2 bias windings of selector magnet E9, through terminal C of plug P24 and jack J24 to terminal 13 of terminal board TB6C, through resistor R23, through terminal 22 of jack J23 and plug P23 through the negative and positive strap of the TEST BIAS MA, to BIAS switch S30. If BIAS switch S30 is in the 20 position, the circuit is completed through resistor R22, through fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4. If BIAS switch S30 is in the 60 position, the circuit is completed through fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4. If BIAS switch S30 is in the POLAR position, the circuit is open at that point.

118. Receiving Multisolenoid Circuit, Receive From Perforator

(fig. 152)

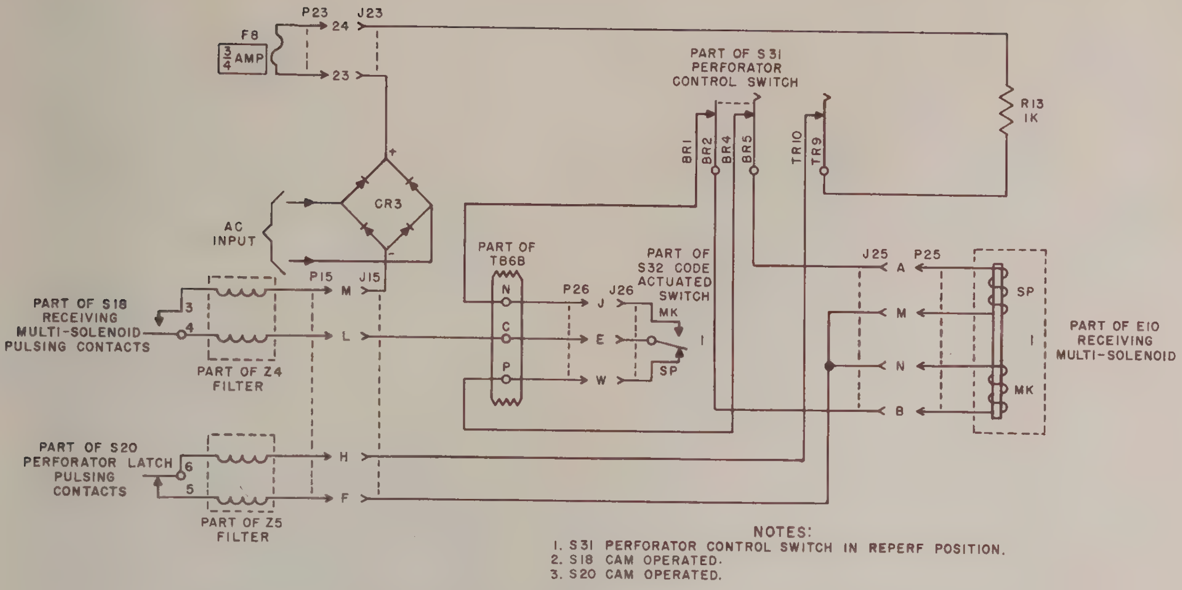
a. When a code group is received electrically in selector magnet E9, it is mechanically transferred to the code plates. When the code plates are positioned they set up circuits through code actuated switch S32. The receiving multisolenoid pulsing contacts (S18) and the perforator latch pulsing contacts (S20) close and permit dc current to flow from rectifier CR3 to the receiving multisolenoid simultaneously for the five intelligence impulses. Two coils are provided in the receiving multisolenoid for each impulse. If the MK coil is energized it moves the associated multisolenoid Y lever to the marking position. If the SP coil is energized, it moves the associated multisolenoid Y lever to the spacing position. The circuit described below is for the first intelligence impulse and is the same for the other four impulses with the exception of the terminal numbers for TB6B, plug P26 and jack J26, plug P25 and jack J25 and the contacts of perforator control switch S31.

b. With perforator control switch S31 in the REPERF position and beginning with the negative side of rectifier CR3, the circuit is traced through terminal M of jack J15 and plug P15, filter Z4, through contact 3 and float 4 of the receiving multisolenoid pulsing contacts S18 and filter Z4, to terminal L of plug P15 and jack J15, to terminal C of terminal board TB6B, to terminal E of plug P26 and jack J26. If the code plate of code actuated switch S32 is moved to the MK position, the circuit continues through the contacts of code actuated switch S32 to terminal J of jack J26 and plug P26 to terminal N of terminal board TB6B. The circuit continues through contact BR1 and float BR2 of perforator control switch S31, which is in the REPERF position, through terminal B of jack J25 and plug P25, through the MK coil of receiving multisolenoid E10, through terminal N of plug P25 and jack J25, through terminal F of jack J15 and plug P15. The circuit continues through filter Z5 and contact 5 and float 6 of the perforator latch pulsing contacts S20, through filter Z5 and terminal H of plug P15 and jack J15, through contact TR10 and float TR9 of perforator control switch S31, through resistor R13. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3. If the code plate of code actuated switch S32 moves to the SP position, the circuit is traced from terminal E of plug P24 and jack J24, through a contact of code actuated switch S32, to terminal W of jack J26 and plug P26, through terminal P of terminal board TB6B, through contact BR4 and float BR5 of perforator control switch S31, to terminal A of jack J25 and plug P25, through the SP coil of receiving multisolenoid E10, through terminal M of plug P25 and jack J25. The circuit continues through terminal F of jack J15 and plug P15, filter Z5, through contact 5 and float 6 of perforator latch pulsing contacts S20, filter Z5, through terminal H of plug P15 and jack J15, through contact TR10 and float TR9 of perforator control switch S31, and through resistor R13. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3.

119. Local Dc Circuits, Perforator.

a. Automatic Line Return Circuit (fig. 153).

(1) When the page printing mechanism is connected in series with a local transmit-



NOTES:
1. S31 PERFORATOR CONTROL SWITCH IN REPERF POSITION.
2. S18 CAM OPERATED.
3. S20 CAM OPERATED.

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Figure 152. Receiving multisolenoid circuit receive from perforator, simplified schematic diagram.

ting mechanism, automatic line return K1 is connected between the local circuit and a signal line so that any start impulse coming from that signal line will cause the page printing mechanism to be disconnected from the local circuit and connected in series with the signal line. When automatic line return K1 is set up, relay A is connected across the signal line and is released by the signal start impulse. When relay A is released, the printer receive circuit is electrically uncoupled from the local circuit and connected in series with the signal line.

(2) The procedure required to set up automatic line return K1 is as follows: with ALR MONITOR switch S24 in the OFF position, operate line switch key S28 to the LINE 1 position. This allows current to flow from the negative side of rectifier CR3, through terminal 11 of automatic line return K1, through relay B, through terminal 9 of automatic line return K1, through contact BL4 and float BL3 of line switch key S28, to the positive side of rectifier CR3. The LINE positions of switch S28 also place a short across relay A. *Relay C is always energized when ALR MONITOR switch S24 is in the OFF position.* Operate ALR MONITOR switch S24 to the LINE 1 position. This causes relay C to release as the circuit to relay C is opened between contact BL1 and float BL2 of ALR MONITOR switch S24. Next, operate line switch key S28 to the TEST position. The signal line can now be traced through automatic line return K1 starting from LINE 1 binding post A, through terminal 14 of plug P23 and jack J23, through contact BL5 and float BL3 of ALR MONITOR switch S24, through terminal 7 of automatic line return K1, through relay A, through contact 6 and float 7 of relay C, through terminal 4 of automatic line return K1, to terminal 16 of jack J23 and plug P23, to AUTO LINE RET IN jack J42. The circuit continues through PRINTER REC plug P35 and jack J35, to AUTO LINE RET IN plug P42, through terminal 15 of plug P23 and jack J23, to terminal 2 of automatic line return K1. The circuit continues through float 4 and contact 3 of relay C to terminal 1 of automatic line return K1, through float BR1 and contact BR3 of ALR MONITOR switch S24, through contacts BR7, BR6, BL6 and BL7 of line switch key S28, to terminal 4 of jack J23 and

plug P23, to LINE 1 jack J44 and plug P44, to DC switch S26. When DC switch S26 is in the ON position, the circuit continues through fuse F7, to terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4. The circuit is traced through rectifier CR4 and out the negative side to terminal 8 of jack J23 and plug P23, through INCREASE LINE 1 resistor R19, through resistor R18, through DC switch S26, to binding post B of LINE 1. If DC switch S26 is in the OFF position, the circuit is traced through the switch directly to binding post B of LINE 1. The current passing through relay A causes it to operate, closing its contact to close the circuit from rectifier CR3 to relay C. Relay C operates its floats 12, 10, 7, 4, and 1 closing contacts 8, 5, and 2 and opening contacts 11, 9, 6, and 3. When line test switch S28 was operated to the TEST position, the circuit to relay B was opened at contact BL4 and float BL3 of line switch key S28. However, relay B is slow to release, and its contacts do not open until after relays A and C have operated. After relay C has operated, the circuit can be traced from binding post A of LINE 1, to terminal 14 of plug P23 and jack J23, through contact BL5 and float BL3 of ALR MONITOR switch S24, through terminal 7 of automatic line relay K1, through relay A, through float 1 and contact 2 of relay B, to terminal 1 of automatic line return K1, through float BR1 and contact BR3 of ALR MONITOR switch S24, through contacts BR7, BR6, BL6, and BL7 of line switch key S28 to terminal 4 of jack J23 and plug P23, to LINE 1 jack J44 and plug P44, to DC switch S26. The circuit can be traced from DC switch S26 to binding post B of LINE 1 as directed above. The printer receive circuit which is patched to AUTO LINE RET IN plug P42 and jack J42 on the patch panel is now connected in series with any circuit patched to AUTO LINE RET OUT plug P 43 and jack J43 through contacts 4 and 5, and 7 and 8 of relay C which is in the operated position.

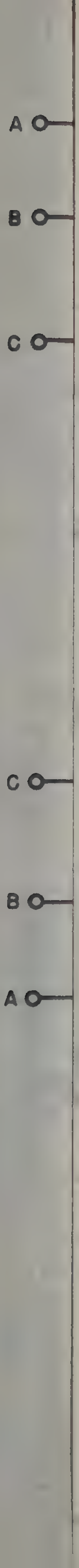
(3) When the circuit connected to the LINE 1 binding posts begins to transmit, the first impulse is the start impulse (no current). During the start impulse, relay A releases. The contacts of relay A open the circuit between rectifier CR3 and relay C, causing relay C to release its floats to the unoperated position. This opens contacts 1 and 2, 4 and 5, and 7 and 8 and closes contacts 3 and 4, 6 and 7, 9 and 10, and 11 and 12. The circuit can now be traced as described in (2) above. The circuit patched to AUTO LINE RET OUT plug P43 and jack J43 can be traced from P43 through terminal 9 of plug P23 and jack J23, to terminal 5 of automatic line return K1, through float 10 and contact 9 of relay C, to terminal 3 of automatic line return K1, through terminal 10 of jack J23 and plug P23, to AUTO LINE RET OUT jack J43.

(4) When line 1 has finished transmitting and it is desired to have AUTO LINE RET OUT and AUTO LINE RET IN connected in series again, but still monitor line 1 if line 1 should begin transmitting, operate line switch key S28 to LINE 1 position. This energizes relay B of automatic line return K1. Then operate line switch key S28 back to the TEST position. The current on line 1 energizes relay A of automatic line return K1 and closes its contacts. The operated contacts of relay A close, energizing relay C. Operating line switch key S28 to TEST also allows relay B to release after relays A and C have operated. Automatic line return K1 is again set up to monitor line 1.

(5) The operation of automatic line return K1 for line 2 is the same as that for line 1 except that the switches are operated to the line 2 position.

b. Perforator Latch Circuit (fig. 154).

(1) When a code group has been received in the receiving multisolenoid and stored in the multisolenoid Y-levers, that code group is then transferred to the code ring cage. This operation is done electrically by energizing perforator latch coil L3. The position of keyboard control switch

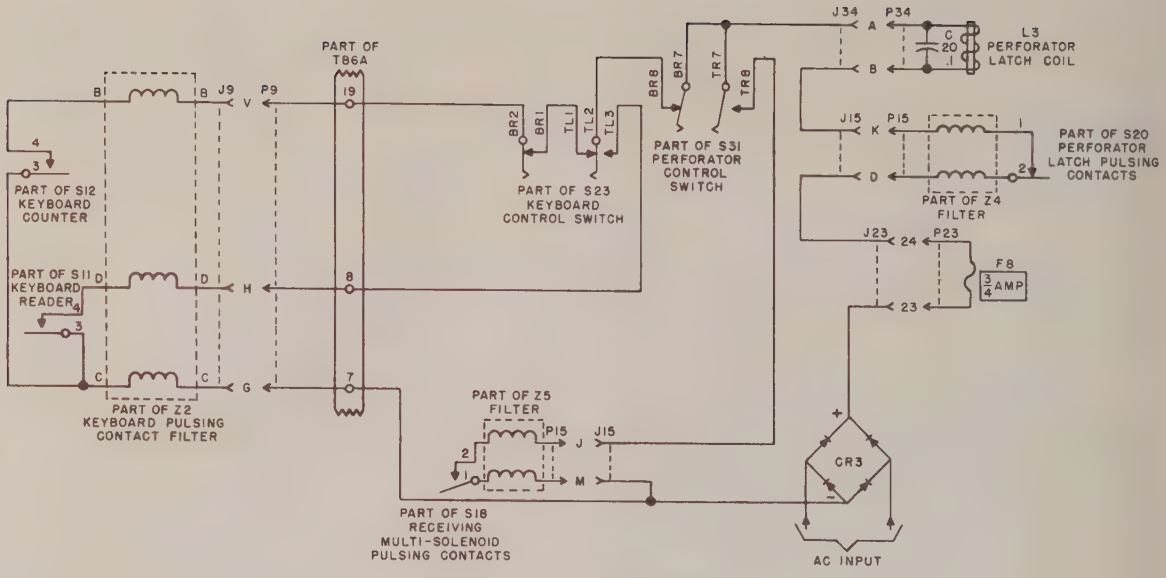

A
B
C
C
B
A

S23 and perforator control switch S31 determines which set of contacts closes the circuit to energize perforator latch coil L3. The dc to energize perforator latch coil L3 is supplied from rectifier CR3. If the perforator is receiving its impulses from the line, perforator control switch S31 is in the REPERF position and receiving multisolenoid pulsing contacts S18 close the circuit to energize perforator latch coil L3. If the keyboard transmitter is sending to the perforator and the line at the same time, keyboard control switch S23 is in the KEYBD & TAPE position and perforator control switch S31 is in the KEYBD position. At this time, keyboard counter contacts S12 close the circuit to energize perforator latch coil L3. If the keyboard transmitter is sending to the perforator only, keyboard control switch S23 is in the TAPE position and perforator control switch S31 is in the KEYBD position. At this time keyboard reader contacts S11 and perforator latch pulsing contacts S20 close the circuit to energized perforator latch coil L3. The circuit for each of the above conditions is described separately below.

(2) When perforator control switch S31 is in the REPERF position, the circuit is traced from the negative side of rectifier CR3 to terminal M of jack J15 and plug P15, through filter Z5, through float 1 and contact 2 of receiving multisolenoid pulsing contacts S18 and filter Z5, through terminal J of plug P15 and jack J15, through contact TR8 and float TR7 of perforator control switch S31. The circuit continues through terminal A of jack J34 and plug P34 through perforator latch coil L3 to terminal B of plug P34 and jack J34, through terminal K of jack J15 and plug P15, through filter Z4, and through normally closed contact 1 and float 2 of perforator latch pulsing contacts S20. The circuit is completed through D of plug P15 and jack J15, through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3.

(3) When keyboard control switch S23 is in the KEYBD & TAPE position and perforator control switch S31 is in the KEYBD position, the circuit is traced from the negative side of rectifier CR3 to terminal 7 of TB6A, through terminal G of plug P9 and jack J9 and terminals C of keyboard pulsing contact filter Z2, to float 3 and contact 4 of keyboard counter S12, the terminals B of keyboard pulsing contact filter Z2, to terminal V of jack J9 and plug P9, through terminal 19 of TB6A. The circuit continues through float BR2 and contact BR1 to contact TL1 and float TL2 of keyboard control switch S23 which is in the KEYBD & TAPE position, through contacts BR8 and float BR7 of perforator control switch S31, through terminal A of jack J34 and plug P34, through perforator latch coil L3, and through terminal B of plug P34 and jack J34. The circuit continues through terminal K of jack J15 and plug P15, through filter Z4, through normally closed contact 1 and float 2 of perforator latch pulsing contacts S20. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3.

(4) When keyboard control switch S23 is in the TAPE position and perforator control switch S31 is in the KEYBD position, the circuit is traced from the negative side of rectifier CR3, through terminal 7 of TB6A, through terminal G of plug P9 and jack J9 and terminals C of keyboard pulsing contact filter Z2, through float 3 and contact 4 of keyboard reader switch S11, and terminals D of the keyboard pulsing contact filter Z2, through terminal H of jack J9 and plug P9, through terminal 8 of terminal board TB6A. The circuit continues through contact TL3 and float TL2 of keyboard control switch S23, which is in the TAPE position, through a contact BR8 and float BR7 of perforator control switch S31, which is in the KEYBD position, through terminal A of jack J34 and plug P34, through perforator latch coil L3, through terminal B of plug P34 and



NOTES:
1. S12 KEYBOARD COUNTER CAM OPERATED.
2. S11 KEYBOARD READER KEY LEVER OPERATED.
3. S23 KEYBOARD CONTROL SWITCH IN KEYBD & TAPE POSITION.
4. S31 PERFORATOR CONTROL SWITCH IN KEYBD POSITION.
5. S18 RECEIVING MULTI-SOLENOID PULSING CONTACTS ARE CAM OPERATED.
6. S20 PERFORATOR LATCH PULSING CONTACTS ARE CAM OPERATED; CONTACTS 1 AND 2 ARE NORMALLY CLOSED.

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Figure 154. Perforator latch circuit, simplified schematic diagram.

jack J34. The circuit continues through terminal K of jack J15 and plug P15, through filter Z4, through normally closed contact 1 and float 2 of perforator latch pulsing contacts S20. The circuit is completed through terminal 24 of jack J23 and plug P23, through fuse F8 and terminal 23 of plug P23 and jack J23, to the positive side of rectifier CR3.

c. Dc Test and Line Switching Circuit (fig. 155, 156, and 157).

(1) *Connections.* This circuit terminates at plug P48 and jack J48, labeled DC TEST, and also at plug P41 and jack J41, labled LINE TEST SW on the patch panel. A test circuit is provided when plug P48 is connected to jack J48 and plug P41 is connected to jack J41 and line switch key S28 is in the TEST position. The output of rectifier CR4 is connected in series with SEND and REC TEST jacks J17 and J18. TEST switch S25 is provided to adapt the circuit for 20- or 60-ma operation. This circuit is especially designed to test the page printer. The SEND (black) and REC (red) plugs P2 and P22 are placed in the TEST jacks J17 and J18, which automatically places the send and receive circuits in series, and provides the proper test current. By patching LINE TEST SW plug P41 and jack J41, in series with other circuits on the patch panel, test current can be supplied to any desired circuit or combination of circuits for local testing purposes. Finally, a switching circuit is provided through the use of line switch key S28. When S28 is operated to the LINE 1 position (fig. 156), LINE TEST SW plug P41 and jack J41 are connected in series with LINE 1 binding posts A, B, and C, through plug P44 and jack J44, labeled LINE 1 on the patch panel. When line switch key S28 is operated to the LINE 2 position, LINE TEST SW plug P41 and jack J41 are connected in series with LINE 2 binding posts A, B, and C, through plug P45 and jack J45, labeled LINE 2 on the patch panel. By connecting some other circuit on the patch panel in series with LINE TEST SW

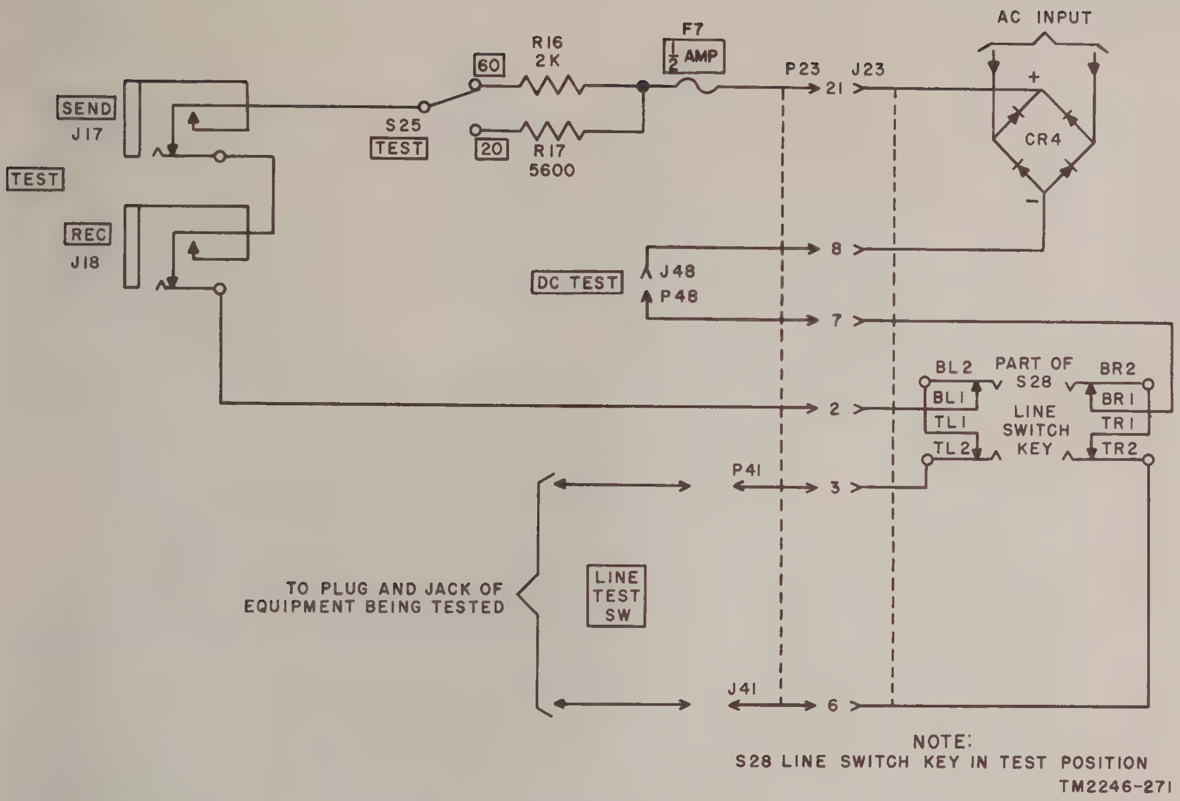
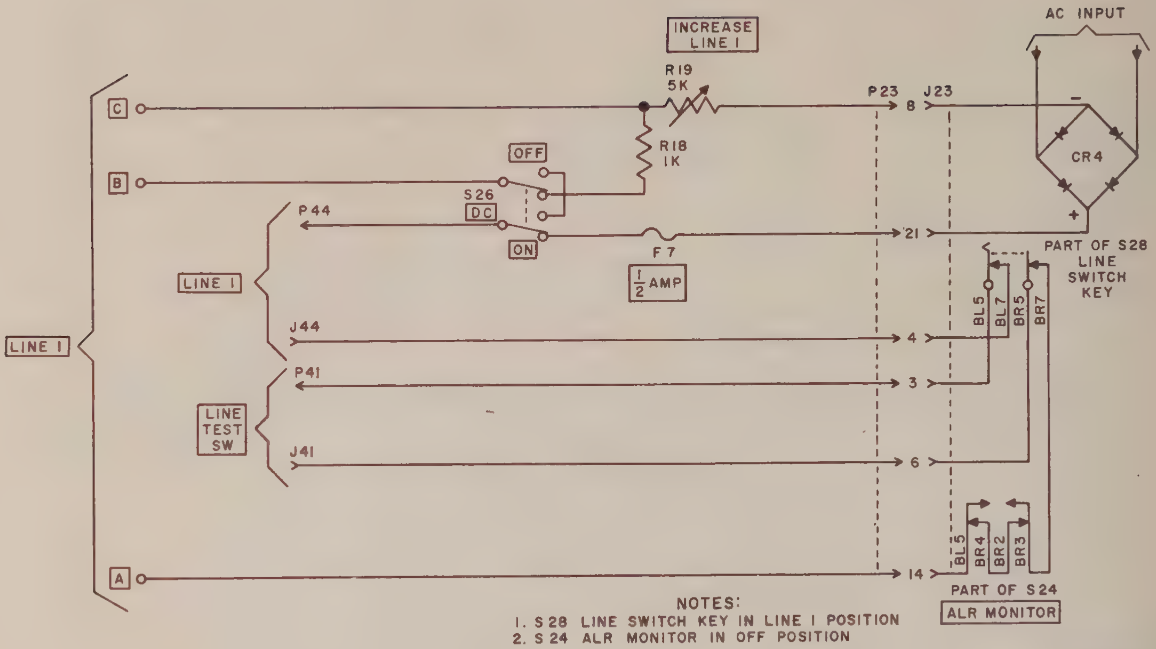


Figure 155. Dc test circuit, simplified schmetic diagram.

plug P41 and jack J41, that other circuit may be switched from the test circuit to either LINE 1 or LINE 2 by operating line switch key S28. Each of the above conditions is described separately below:

(2) *Test circuit* (fig. 155). This circuit begins with the negative side of rectifier CR4 and can be traced through terminal 8 of jack J23 and plug P23, through jack J48 and plug P48, labeled DC TEST on the patch panel, through terminal 7 of plug P23 and jack J23, and through contact BR1 and float BR2 and contact TR1 and float TR2 of line switch key S28, which is in the TEST position; then through terminal 6 of jack J23 and plug P23, through jack J41 and plug P41, labeled LINE TEST SW on the patch panel, through terminal 3 of plug P23 and jack J23, through float TL2 and contact TL1 to float BL2 and contact BL1 of line switch key S28, through terminal 2 of jack J23 and plug P23, through the REC and SEND TEST jacks J18 and J17, to TEST switch S25. With the TEST switch in the 20 position, the circuit is completed through resistor R17, fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4. With TEST switch S25 in the 60 position, the circuit is completed through resistor R16, fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4.

(3) *LINE 1 switching circuit* (fig. 156). When line switch key S28 is placed in LINE 1 position, it places LINE TEST SW plug P41 and jack J41 in series with LINE 1 binding posts A, B, and C. ALR MONITOR switch S24 must be in the OFF position at this time. The circuit begins with LINE TEST SW plug P41, through terminal 3 of plug P23 and jack J23, through float BL5 and contact BL7 of line switch key S28, through terminal 4 of jack J23 and plug P23, through jack J44 and plug P44, labeled LINE 1 on the patch panel. If



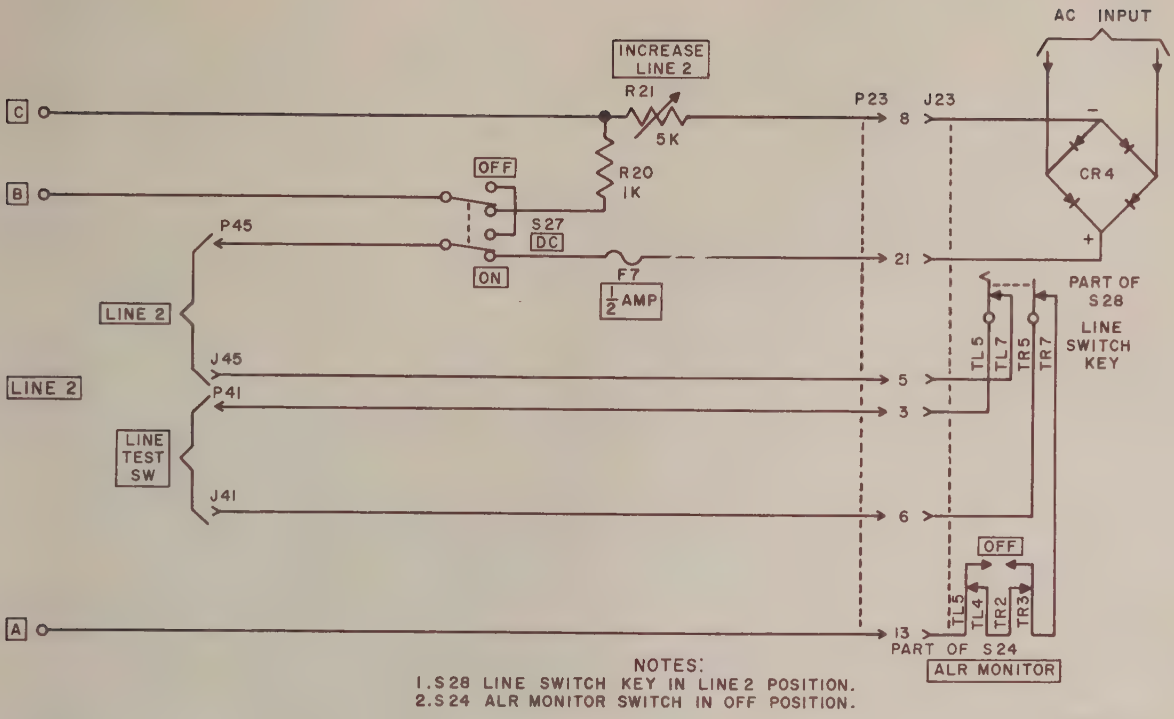
NOTES:
1. S28 LINE SWITCH KEY IN LINE 1 POSITION
2. S24 ALR MONITOR IN OFF POSITION

TM2246-220

Figure 156. LINE 1 switching circuit, simplified schematic diagram.

the current is to be supplied to line 1 from rectifier CR4, DC switch S26 must be in the ON position. The circuit would then continue from plug P44, through DC switch S26, through fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4; then out the negative side of rectifier CR4 and through terminal 8 of jack J23 and plug P23, through INCREASE LINE 1 resistor R19, through resistor R18, through the other contact of DC switch S26 to binding post B of LINE 1. If line current is not to be supplied to LINE 1 from rectifier CR4, DC switch S26 would be in the OFF position and the circuit would then continue from plug P44 through DC switch S26 to binding post B of LINE 1. From LINE TEST SW jack J41, the circuit would be completed through terminal 6 of plug P23 and jack J23 through float BR5 and contact BR7 of line switch key S28 and through contacts BR3, BR2, BL4, and BL5 of ALR MONITOR switch S24 which is in the OFF position, through terminal 14 of jack J23 and plug 23 to binding post A of LINE 1.

(4) *LINE 2 switching circuit* (fig. 157). When line switch key S28 is operated to the LINE 2 position, it places LINE TEST SW plug P41 and jack J41 in series with the LINE 2 binding posts, A, B, and C. ALR MONITOR switch S24 must be in the OFF position at this time. The circuit begins at LINE TEST SW plug P41, through terminal 3 of plug P23 and jack J23, through float BL5 and contact BL7 of the line switch key S28, through terminal 5 of jack J23 and plug P23, through jack J45 and plug P45, labeled LINE 2 on the patch panel. If line current is to be supplied to LINE 2 from rectifier CR4, DC switch S27 must be in the ON position. The circuit would then continue from plug P45, through DC switch S27, through fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4, out the negative side of rectifier CR4, through terminal 8 of jack J23 and plug P23, through INCREASE LINE 2 resistor R21, through resistor R20, through the other contact of DC switch S27, to binding post B of LINE 2. If line current is not to be supplied to LINE 2 from



NOTES:
1. S28 LINE SWITCH KEY IN LINE 2 POSITION.
2. S24 ALR MONITOR SWITCH IN OFF POSITION.

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Figure 157. LINE 2 switching circuit, simplified schematic diagram.

rectifier CR4, DC switch S27 would be in the OFF position and the circuit would continue from plug P45 through both contacts of DC switch S27 to binding post B of LINE 2. From jack J41, the circuit is completed through terminal 6 of plug P23 and jack J23, through float TR5 and contact TR7 of line switch key S28, through contacts TR3, TR2, TL4, and TL5 of ALR MONITOR switch S24, which in the OFF position, through terminal 13 of jack J23 and plug P23 to binding post A of LINE 2.

d. Manual Tape Feed-Out Circuit (fig. 144).

(1) When perforator control switch S31 is in the REPERF position, the manual tape feed-out circuit provides a means of holding perforator latch coil L3 energized to manually feed-out tape so that the end of the tape message can be removed from the machine. This circuit is controlled by the manual tape feed-out lever which operates manual tape feed-out switch S34. The dc to energize perforator latch coil L3 is supplied by rectifier CR3.

(2) The circuit may be traced from the negative side of rectifier CR3, through terminal R of terminal board TB6B, through the contacts of manual tape feed-out switch S34, when operated, through terminal S of terminal board TB6B, through contact TR8 and float TR7 of perforator control switch S31 which is in the REPERF position, to terminal A of jack J34 and plug P34. The circuit continues through perforator latch coil L3, through terminal B of plug P34 and jack J34 to terminal 24 of jack J23 and plug P23. The circuit is then completed through fuse F8 through terminal 23 of plug P23 and jack J23 to the positive side of the rectifier CR3.

e. Voltage Test Circuit (fig. 158).

(1) This circuit provides a means of testing the output voltage of rectifier CR4 through the use of the TEST VOLTS CR4, jacks J32 and J33. If the voltage is not correct, adjust the taps on the secondary of transformer T2. The TEST VOLTS CR4 jacks (J32 and J33) are

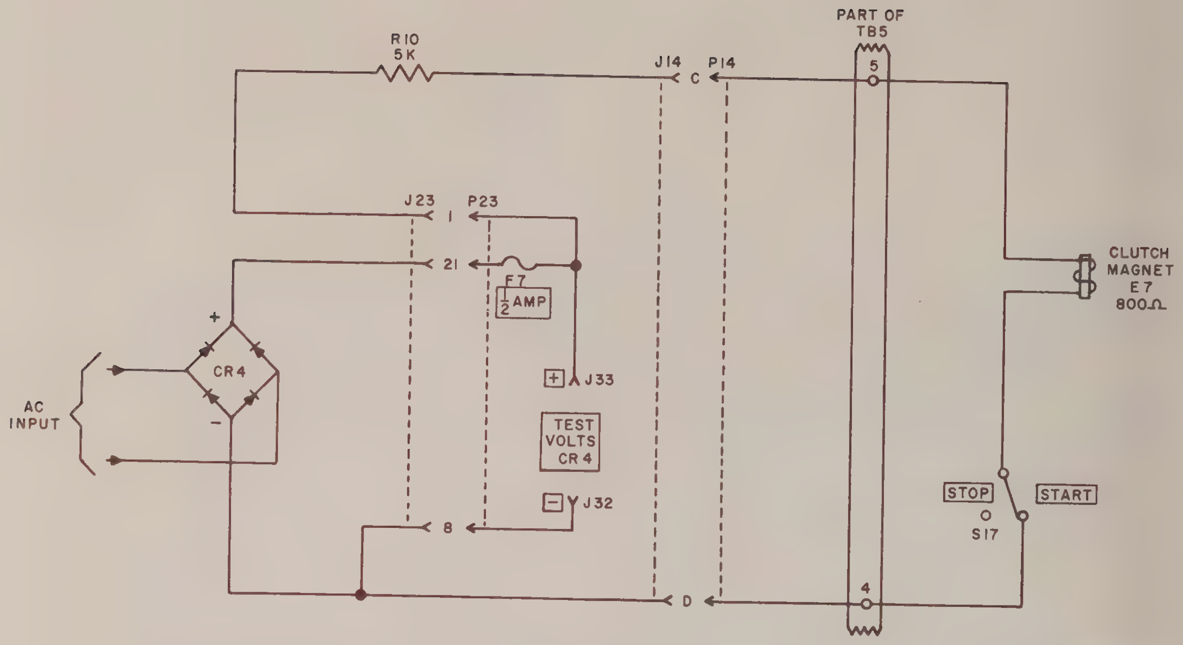


Figure 158. Transmitter-distributor clutch magnet E7 and voltage test circuit, simplified schematic diagram.

marked + and — for the test leads of a voltmeter.

(2) The circuit can be traced from the negative side of rectifier CR4, through terminal 8 of jack J23 and plug P23, to TEST VOLTS CR4 jack J32, labeled —; from the positive side of the rectifier through terminal 21 of jack J23 and plug P23, through fuse F7, to TEST VOLTS CR4 jack J33 labeled +.

f. Transmitter-Distributor Clutch Magnet Circuit (fig. 158).

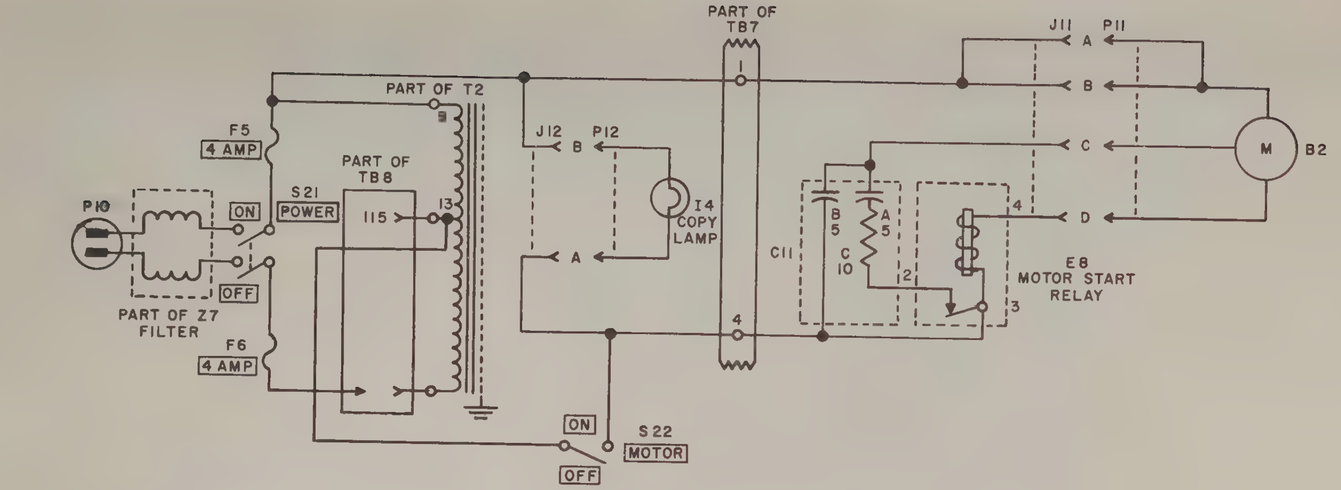
(1) Clutch magnet E7 controls the rotation of the transmitter camshaft of the transmitter-distributor. Clutch magnet E7 is supplied dc by rectifier CR4 and is controlled by transmitter - distributor START-STOP switch S17.

(2) Transmitter-distributor clutch magnet E7 circuit is traced as follows: from the negative side of rectifier CR4, through terminal D of jack J14 and plug P14 to terminal 4 of terminal board TB5. If START-STOP switch S17 is in the START position, the circuit continues through START-STOP switch S17, through clutch magnet E7 to terminal 5 of terminal board TB5, through terminal C of plug P14 and jack J14, through resistor R10, through terminal 1 of jack J23 and plug P23, through fuse F7, through terminal 21 of plug P23 and jack J23 to the positive side of rectifier CR4. If transmitter-distributor START-STOP switch S17 is in the STOP position, the circuit is open at that point.

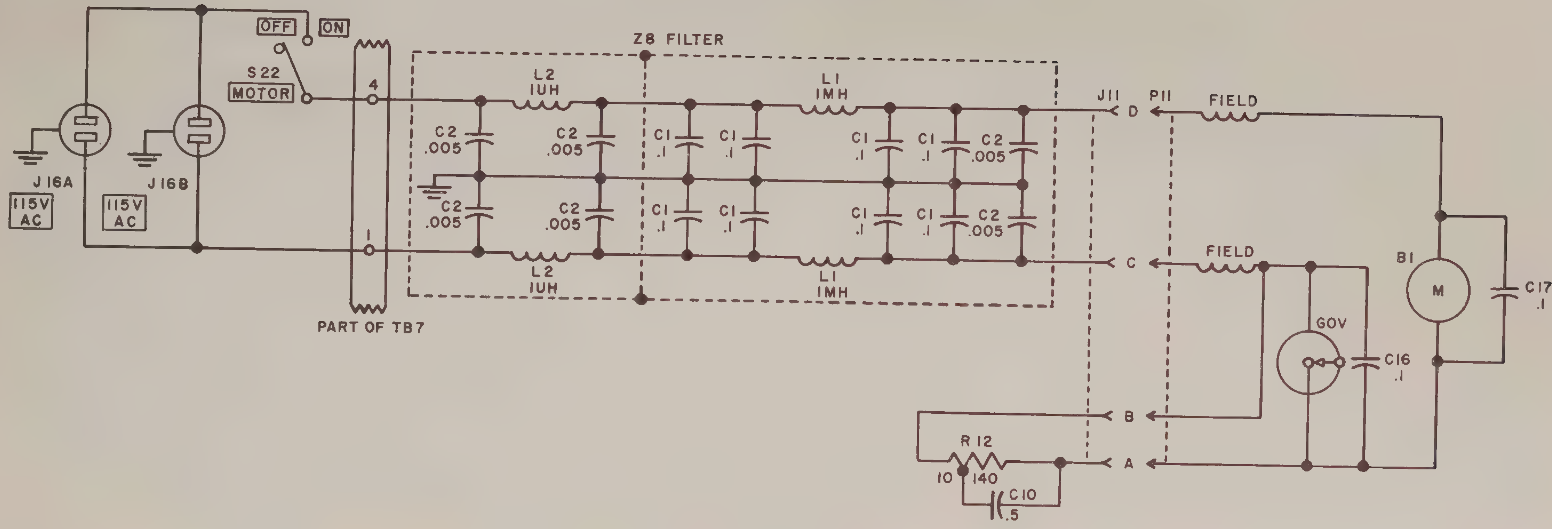
120. Perforator Motors and Ac Circuits

a. Perforator Motor and Copy Lamp Circuits (fig. 159). Motor B1 or B2 and copy lamp I 4 of the perforator operate on 115 volts, 50 to 60 cycles ac. This ac is obtained from the 115-volt tap of the primary winding of transformer T2 and is controlled by MOTOR switch S22, located on the front of the perforator. At this point 115 volts is always present whenever the adjustable tap is connected to the jack on TB8 that corresponds to the ac input voltage. The AN/FGC–25 is equipped with synchronous motor B2 while the AN/FGC–25X is equipped with series-governed motor B1. The two motor circuits and the copy lamp circuit are described separately below.

(1) *Copy lamp I 4 circuit.* The copy lamp I 4 circuit is traced from the 115-volt tap numbered terminal 13, of the primary winding of transformer T2, through MOTOR switch S22, through terminal A of jack J12 and plug P12, through copy



A. SYNCHRONOUS MOTOR B2



B. SERIES-GOVERNED MOTOR B1

TM2246-285

Figure 159. Perforator motor and copy light circuits, simplified schematic diagram.

lamp I 4, through terminal B of plug P12 and jack J12, to terminal 9 of the primary winding of transformer T2.

(2) *Synchronous motor B2 circuit.* The circuit begins at the 115-volt tap, numbered terminal 13, of the primary winding of transformer T2 and is traced through MOTOR switch S22, through terminal 4 of terminal board TB7. At this point, the circuit divides. One path is traced through terminals 3 and 4 of motor-start relay E8, through terminal D of jack J11 and plug P11, through synchronous motor B2, through terminal A of plug P11 and jack J11. The second path is traced through capacitor C11B, through terminal C of jack J11 and plug P11, through synchronous motor B2, through terminal B of plug P11 and jack J11. At this point, the two paths join and the circuit continues through terminal 1 of terminal board TB7 to terminal 9 of the primary winding of transformer T2. When MOTOR switch S22 is first turned on, a surge of current passes through the coil of motor-start relay E8 and causes the relay float to operate. When the float is operated, it places capacitor C11B in parallel with capacitor C11A and resistor C11C. This shifts the phase of the current supplying the additional torque necessary to turn the motor armature, building up its speed rapidly. Once motor B2 has reached its proper speed (3,600 rpm), the current passing through the coil of motor-start relay E8 decreases to a value that causes the relay coil to release the float. The current through the starting winding of the motor returns to its initial phase because it now passes only through capacitor C11B. Capacitor C11A and resistor C11C are disconnected from the circuit when the float of motor-start relay E8 is released.

(3) *Series-governed motor B1 circuit.* The circuit begins at the 115-volt tap, numbered terminal 13 of the primary winding of transformer T2 and is traced through MOTOR switch S22, through terminal 4 of terminal board TB7, through filter Z8, through terminal D of jack J11 and plug P11, through one of the field windings of series-governed motor B1, through the armature, through the governor contacts, through the other field winding, through terminal C of plug P11 and jack J11. The circuit is completed through filter Z8, through terminal 1 of terminal board TB7, to primary winding 9 of the transformer T2. When the motor has reached the proper speed, centrifugal force overcomes the pull of the governor contact spring and the governor contacts open. The circuit is traced from terminal D of plug P11, through one of the field windings of the motor, through the armature, through terminal A of plug P11 and jack J11, through resistor R12, to terminal B of jack J11 and plug P11, through the other field winding to terminal C of plug P11 and jack J11. This reduces the current flowing through the field windings, since resistor R12 was placed in series in the line, and the motor speed decreases until the governor contacts close. The current through series-governed motor B1 is increased until the governor contacts again open. This procedure continues as long as the motor is running. Capacitors C10, C16, and C17 and filter Z8 are provided to suppress the rf interference generated by series-governed motor B1.

b. Tape-out Alarm Circuit (fig. 147).

(1) This circuit supplies 6.3 volts ac from the primary winding of transformer T2 through alarm switch S16 to tape alarm buzzer I 5. The buzzer sounds an audible alarm when the perforator tape supply is low.

(2) The circuit begins with the jack labeled 6 on TB8, and continues through terminal A of jack J13 and plug P13 through tape alarm buzzer I 5, through alarm switch S16, through terminal B of plug P13 and jack J13, to terminal 9 of the primary winding of transformer T2.

121. Teleprinter Connecting Circuits

a. PRINTER SEND Connecting Circuit (fig. 160).

(1) This circuit provides a means of connecting PRINTER SEND plug P21 to the patch panel at PRINTER SEND plug P36 and jack J36, through SEND jack

J21. This connecting circuit makes it possible to connect the PRINTER SEND circuit in series with any other circuit on the patch panel.

(2) The circuit may be traced from PRINTER SEND plug P36 to the tip of SEND jack J21. When PRINTER SEND plug P21 is not inserted in SEND jack J21, the circuit would be completed through the shorting contacts of SEND jack J21 to PRINTER SEND jack J36. When PRINTER SEND plug P21 is inserted in SEND jack J21, the circuit would then be traced from PRINTER SEND plug P36, through the tip of PRINTER SEND plug P21, through the printer send circuit back to the sleeve of PRINTER SEND plug P21, through the sleeve of SEND jack J21 to PRINTER SEND jack J36.

b. PRINTER REC Connecting Circuit (fig. 160).

(1) This circuit provides a means of connecting PRINTER REC plug P22 to the patch panel at PRINTER REC plug P35 and PRINTER REC jack J35 through the REC jack J22. This connecting circuit makes it possible to connect the PRINTER circuit in series with any other circuit on the patch panel.

(2) The circuit may be traced from PRINTER REC plug P35 to the tip of REC jack J22. When red REC plug P22 is not inserted in REC jack J22, the circuit would be completed through the shorting contacts of REC jack J22 to PRINTER REC jack J35. When the red REC plug P22 is inserted in REC jack J22, the circuit would be traced from PRINTER REC plug P35 to REC jack J22, to the tip of the red REC plug P22, through the printer receive circuit back to the sleeve of REC P22, and through the sleeve of REC jack J22 to PRINTER REC jack J35.

c. Line 1 Circuit (fig. 161).

(1) This circuit provides a means of connecting the LINE 1 binding posts A, B, and C, in series with any circuit on the patch panel through the use of plug P44 and jack J44, labeled LINE 1 on the patch panel. Binding posts A and B are normally used. Binding posts A and C are used when the line current cannot be brought up to the proper level by maximum adjustment of the variable resistor R19. DC switch S26, located on the back of the perforator, is provided for supplying line current from rectifier CR4. Line switch key S28 and ALR MONITOR switch S24 must be in LINE 1 and OFF position. Plug P23 is connected to jack J23. If line current is not being supplied from rectifier CR4 on line 1, the line connections must be made to binding posts A and B. The circuit is described with the DC switch S26 in the ON and OFF positions separately as follows:

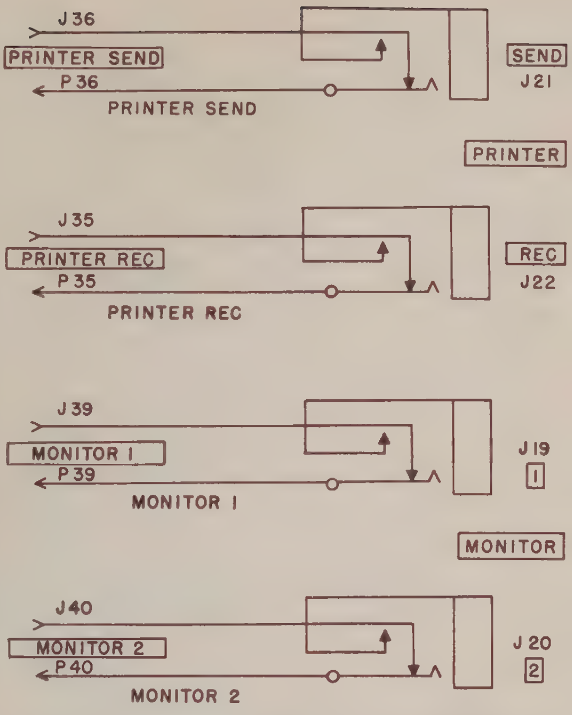


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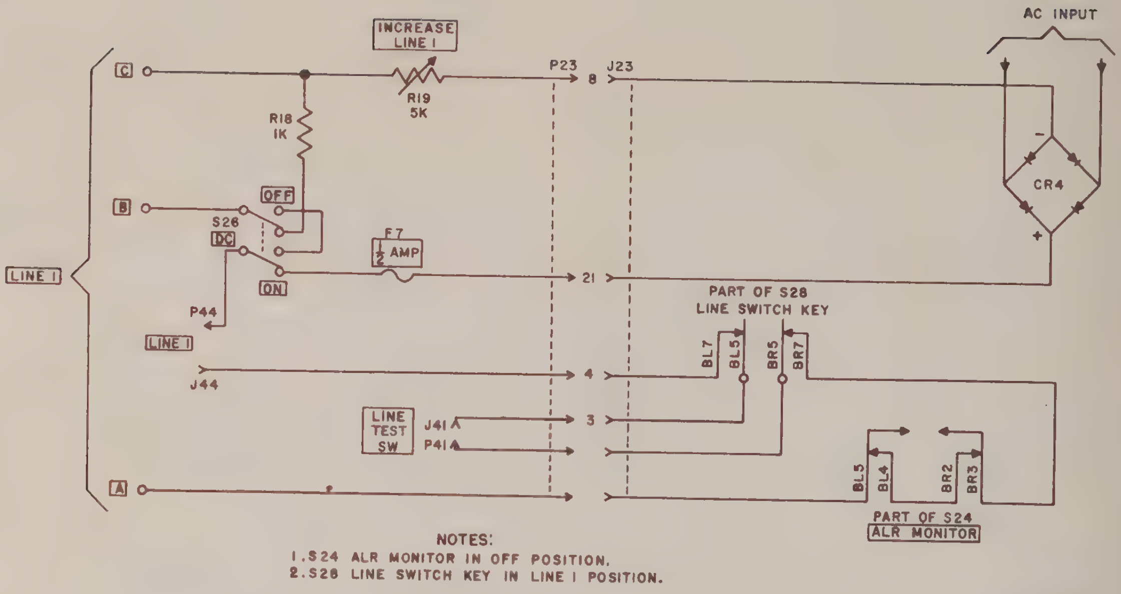
Figure 160. PRINTER SEND and PRINTER REC connecting circuits, and MONITOR 1 and MONITOR 2 connecting circuits, simplified schematic diagrams.

(2) The line 1 circuit is traced from binding post A through terminal 14 of plug P23 and jack J23, through contacts BL5, BL4, BR2, and BR3 of ALR MONITOR switch S24, which is in the OFF position, through the contacts BR7 and BR5 of line switch key S28, which is in the LINE 1 position, through terminal 6 of jack J23 and plug P23, to the LINE TEST SW jack J41 and plug P41, through terminal



NOTES:
1. S24 ALR MONITOR IN OFF POSITION.
2. S28 LINE SWITCH KEY IN LINE I POSITION.

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Figure 161. Line 1 circuit, simplified schematic diagram.

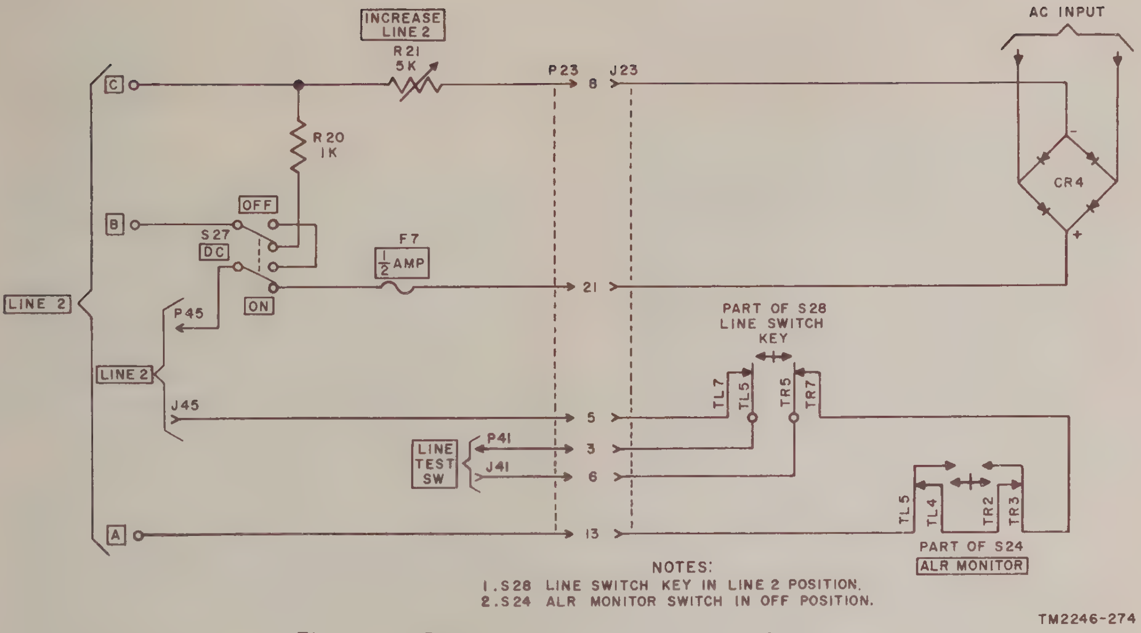
3 of plug P23 and jack J23. The circuit continues through float BL5 and contact BL7 of the line switch key S28, through terminal 4 of jack J23 and plug P23, to LINE 1 jack J44 on the patch panel. With DC switch S26 in the OFF position, the circuit is completed from LINE 1 plug P44, through the DC switch S26, to binding post B.

(3) When DC switch S26 is in the ON position, the circuit is traced from binding post A to LINE 1 jack J44 on the patch panel the same as above. The circuit continues from LINE 1 plug P44 through DC switch S26, through fuse F7, through terminal 21 of plug P23 and jack J23 to the positive side of rectifier CR4. The circuit is completed from the negative side of rectifier CR4, through terminal 8 of jack J23 and plug P23, through INCREASE LINE 1 resistor R19, through resistor R18, through the other contact of DC switch S26 to binding post B. If the proper line current cannot be obtained by maximum adjustment of variable resistor R19, the line connections will be made to binding posts A and C. The circuit is traced the same as above except resistor R18 is bypassed to binding post C.

d. Line 2 Circuit (fig. 162).

(1) This circuit provides a means of connecting the line 2 binding posts A, B, and C, in series with any circuit on the patch panel through the use of plug P45 and jack J45, labeled LINE 2 on the patch panel. Binding posts A and B are normally used. Binding posts A and C are used when the line current cannot be brought up to the proper level by maximum adjustment of the variable resistor R21. DC switch S27, located on the back of the perforator, is provided for supplying line current from rectifier CR4 if so desired. The line switch key S28 and ALR MONITOR switch S24 must be in the LINE 2 and OFF positions. If line current is not being supplied from rectifier CR4 on line 2, the line connections must be made to binding posts A and B. The circuit is described with the DC switch S27 in the ON and OFF positions separately as follows:

(2) The line 2 circuit may be traced from binding post A through terminal 13 of plug P23 and jack J23, through the contacts TL5, TL4, TR2, TR3, ALR MONITOR switch S24 which is in the OFF position, through contacts TR7 and TR5 of line



NOTES:
1. S28 LINE SWITCH KEY IN LINE 2 POSITION.
2. S24 ALR MONITOR SWITCH IN OFF POSITION.

Figure 162. Line 2 circuit, simplified schematic diagram.

switch key S28, which is in the LINE 2 position, through terminal 6 of jack J23 and plug P23, through LINE TEST SW jack J41 and plug P41, and through terminal 3 of plug P23 and jack J23. The circuit continues through contacts TL5 and TL7 of the line switch key S28, through terminal 5 of jack J23 and plug P23 to LINE 2 jack J45 on the patch panel. With DC switch S27 in the OFF position, the circuit is completed from LINE 2 plug P45 through DC switch S27 to binding post B.

(3) When switch S27 is in the ON position, the circuit may be traced from binding post A to LINE 2 jack J45 on the patch panel the same as above. The circuit then continues from LINE 2 plug P45 through DC switch S27, through fuse F7, through terminal 21 of plug P23 and jack J23, to the positive side of rectifier CR4. The circuit is then completed from the negative side of rectifier CR4, through terminal 8 of jack J23 and plug P23, through the INCREASE LINE 2 resistor R21, through resistor R20, through the other contact of DC switch S27, to binding post B. If the proper line current cannot be obtained by maximum adjustment of resistor R21, the line connections shall be made by binding posts A and C. The circuit is traced the same as above except resistor R20 is bypassed to binding post C.

e. Line 3 Circuit (fig. 163). This circuit provides a means of connecting the LINE 3 binding

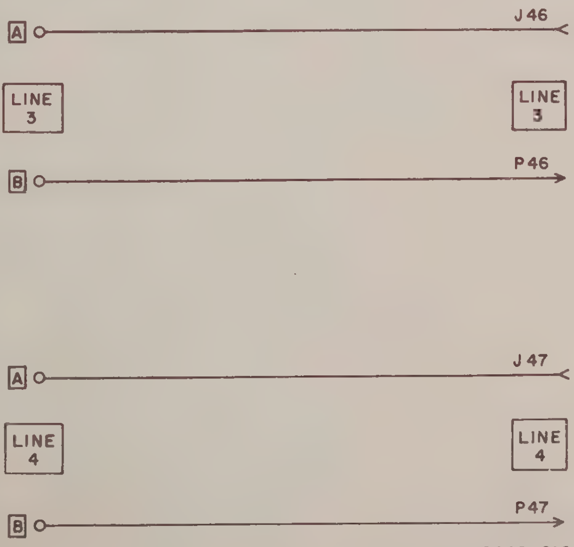


Figure 163. Lines 3 and 4 circuits, simplified schematic diagram.

posts A and B on the back of the perforator in series with any other circuit on the patch panel through the use of the plug P46 and jack J46, labeled LINE 3 on the patch panel.

f. Line 4 Circuit (fig. 163). This circuit provides a means of connecting the LINE 4 binding posts A and B on the back of the perforator in series with any other circuit on the patch panel through the use of plug P47 and jack J47, labeled LINE 4 on the patch panel.

g. Monitor Number 1 Connecting Circuit (fig. 160).

(1) This circuit provides a means of connecting a receiving unit in series with any circuit on the patch panel through jack J19 and plug P39 and jack J39, labeled MONITOR 1 on the patch panel.

(2) This circuit would be traced in the same manner as the printer send and printer receive connecting circuits (*a* and *b* above).

h. Monitor Number 2 Connecting Circuit.

(1) This circuit provides a means for connecting a second receiving unit in series with any circuit on the patch panel through jack J20, plug P40, and jack J40, labeled MONITOR 2 on the patch panel.

(2) This circuit would also be traced in the same manner as the printer send and printer receive connecting circuits (*a* and *b* above).

CHAPTER 5
AUXILIARY EQUIPMENT

122. Purpose

Teletypewriter Sets AN/FGC–25(*) are usually operated without line relays in the incoming signal line. In cases where signal lines are subject to extreme interference from outside sources, line relays may be used to convert distorted incoming signals to improved signals which are more easily interpreted by the teleprinter receiving units. To permit the use of line relays, a line relay adapter is supplied with these sets. The adapter includes the necessary circuits, switches, and mountings to permit conversion of the set for line relay operation.

Note. Relays for use as line relays with these sets are not provided as components of the sets. If a set is to be installed for use with line relays, the line relays must be obtained through the supply channels.

123. Description

The line relay adapter (fig. 164) is a rectangular metal box that provides the receptacles to install the line relay cables from the page printer and the perforator. These cables are equipped with multiple contact connectors, and connect by means of nut fasteners. Inside of the box are the filters, resistors, switches, sockets, and necessary wiring.

124. Installation

a. Line Relay Adapter Installation.

(1) Remove the line relay adapter mounting screws from the shipping box containing the line relay adapter.

(2) Position the line relay adapter on the table and install with the mounting screws.

b. Page Printer Modifications.

(1) Remove the page printer power cord from convenience outlet J16A or J16B at the back of the perforator.

(2) Remove the page printer signal line SEND and REC plugs P21 and P22 from the PRINTER SEND and PRINTER REC jacks J21 and J22 on the perforator.

(3) Remove the page printer dust cover.

(4) Remove the cover from the terminal box (fig. 13).

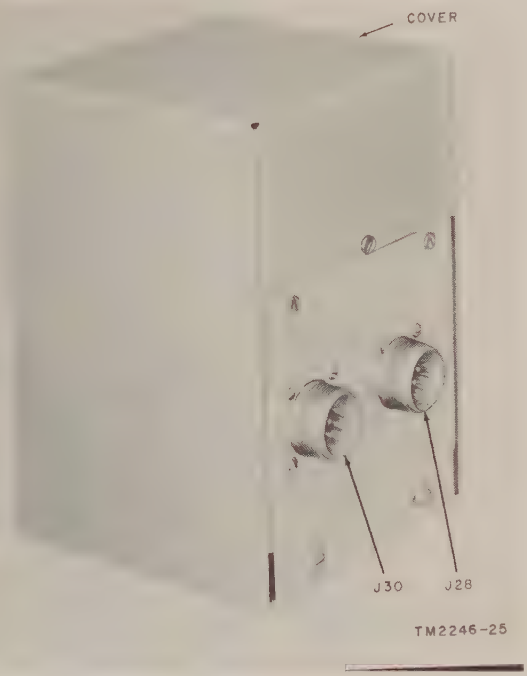


Figure 164. Line relay adapter.

(5) Remove all of the plugs from the jacks of terminal board TB3 inside the terminal box. Connect the supplied page printer line relay cable through the hole in the terminal box cover to the terminal board TB3 as follows (fig. 165):

- (*a*) Plug 5 in jack 2.
- (*b*) Plug 12 in jack 7.
- (*c*) Plug 10 in jack 4.
- (*d*) Plug 11 in jack 3.
- (*e*) Plug 16 in jack 10.

(6) Reconnect the removed plugs as follows:

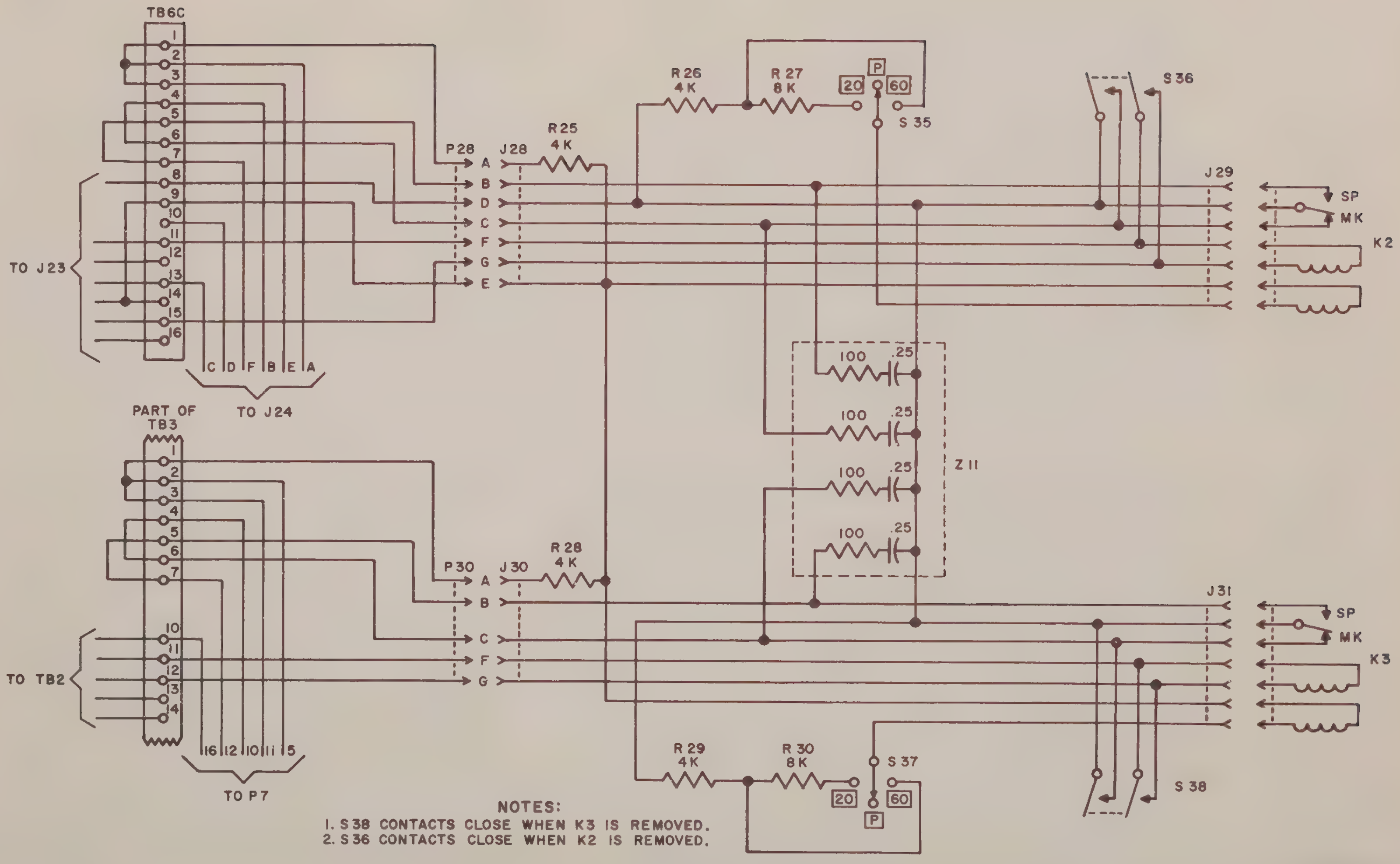
- (*a*) Plug A in jack 1.
- (*b*) Plug B in jack 5.
- (*c*) Plug C in jack 6.
- (*d*) Plug F in jack 11.
- (*e*) Plug G in jack 12.

(7) Replace the cover on the terminal box.

(8) Replace the page printer dust cover.

(9) Reconnect the page printer signal line plugs.

(10) Reconnect the page printer power cord.



NOTES:
1. S38 CONTACTS CLOSE WHEN K3 IS REMOVED.
2. S36 CONTACTS CLOSE WHEN K2 IS REMOVED.

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Figure 165. Line relay adapter, schematic diagram.

c. Perforator Modifications.

(1) Remove the perforator power cord from the power outlet.

(2) Remove the signal lines from the binding posts.

(3) Remove the dust cover.

(4) Tip the perforator on its right side and remove the screws that hold the base plate to the base; remove the base plate.

(5) Remove all of the plugs from the jacks of terminal board TB6C. Connect the supplied perforator line relay cable to the terminal board TB6C as follows (fig. 165):

- (*a*) Plug A in jack 2.
- (*b*) Plug E in jack 3.
- (*c*) Plug B in jack 4.
- (*d*) Plug F in jack 7.
- (*e*) Plug D in jack 10.
- (*f*) Plug C in jack 13.

(6) Reconnect the removed plugs as follows:

- (*a*) Plug A in jack 1.
- (*b*) Plug B in jack 5.
- (*c*) Plug C in jack 6.
- (*d*) Plug D in jack 8.
- (*e*) Plug E in jack 9.
- (*f*) Plug F in jack 11.
- (*g*) Plug G in jack 15.

(7) Reverse procedure given in (1) through (4) above.

d. Line Relay Adapter Adjustment.

(1) Connect the line relay cables from the page printer and the perforator to the line relay adapter with the cable from the page printer connected to the receptacle (J30) nearest the page printer, and the cable from the perforator connected to the receptacle (J28) nearest the perforator.

(2) Loosen the cover mounting screws and remove the cover (fig. 164) from the line relay adapter.

(3) Set S35 and S37 (fig. 166) for the type of operation desired (20-ma, 60-ma, or polar.)

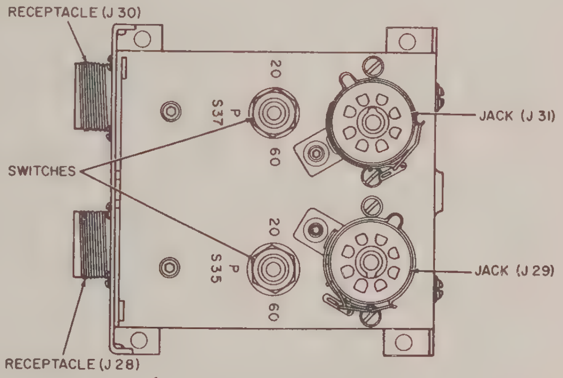
(4) Install the line relays in jacks J29 and J31 in the line relay adapter. (*See Note* in paragraph 123.)

(5) Reinstall the cover on the line relay adapter. Tighten the mounting screws.

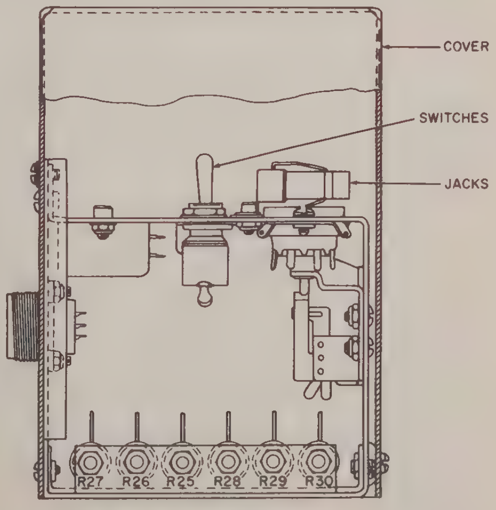
125. Theory of Line Relay Operation

a. The incoming teleprinter signal can be a 60- or 20-ma signal, or a polar signal. Switches S35 and S37 are used to adapt the teleprinter circuits to operate with the current in the incoming signal line. When the teleprinter is used without line relays, bias switches S7 and S30 perform the same function. The line relay adapter provides a convenient way to mount two line relays, one of which acts to control the flow of current to page printer selector magnet E2 and the other to control the flow of current to perforator selector magnet E9.

b. The line relays operate only on the receive circuit of the page printer and the perforator, because their only purpose is to permit satisfactory operation of these units while receiving distorted



A. TOP VIEW WITH COVER OFF



B. SIDE VIEW, COVER BROKEN

Figure 166. Relay adapter, top and side views.

or weak signals. Each line relay includes bias and line windings that control the motion of an armature.

c. In neutral operation, the line winding is used to move the armature to the marking position, closing the circuit to that portion of the line winding of the selector magnet that moves the selector magnet armature to the marking position. When a space (no current) impulse is received from the signal line, the bias winding of the line relay, which is energized by the teleprinter circuits, moves the armature of the line relay to the spacing position. This closes the circuit to the other portion of the line winding of the selector magnet, which moves the selector-magnet armature to the spacing position. This procedure, which consists of dividing the selector-magnet line winding into two halves and connecting them in separate circuits and energizing one or the other portion to move the armature of the selector magnet to its two positions, is called *polal operation.* When the line winding of the line relay is energized, it has approximately twice the current flowing through it that is present in the bias winding. This allows the line winding to overcome the electromagnetic force exerted by the bias winding and moves the armature. Switches S35 and S37 mounted in the line relay adapter are set in one of three positions, depending upon line conditions. In neutral operation, if the signal line carries 60-ma, switches S35 and S37 are placed in the 60-ma position. The current flows through resistor R29 in the page printer bias circuit and through resistor R26 in the perforator bias circuit. Both are 4K resistors. When the switches are placed in the 20-ma position, an additional resistor is inserted in each bias circuit. These resistors are R30 for the page printer and R27 for the perforator. Each resistor has a value of 8K, making a total of 12K for each bias circuit.

d. In polar operation, line relay switches S35 and S37 are moved to the P position. This disconnects the bias winding of the line relay from the teleprinter circuits. The polar signals reverse the direction of the flow of current for marking and spacing impulses causing the line winding of the relay to move its armature to the marking or spacing position. This closes the two circuits to either of the electrically independent halves of the selector-magnet line winding as described above.

e. Switches S36 and S38 are self-closing switches, which automatically close when the line relays are removed. When the switches are closed, they short the signal line and close the mark contacts of the line relay to the selector magnet. The signal line will be closed and the receiving mechanism of the teleprinter will run closed.

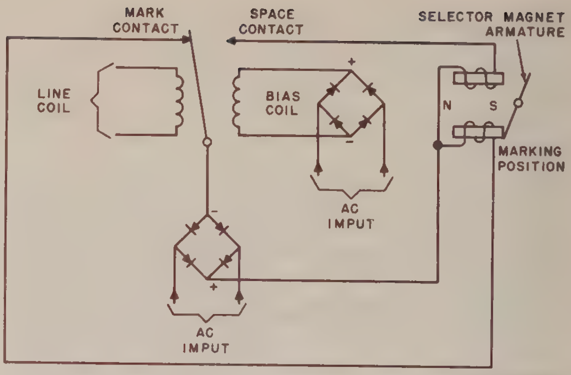


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Figure 167. Polal operation, schematic diagram.

f. Filter Z11 is a radio-frequency suppression filter which reduces the emission of radio frequency waves to a minimum. This enables the unit to be operated in conjunction with electronic radio equipment without interfering unduly with its reception.

126 Maintenance

The line relay adapter requires no lubrication. Maintenance of the unit is limited to the visual inspection of the external and internal portions of the unit.

a. External Visual Inspection.

(1) Inspect the line relay adapter for cracks, breaks, loose or missing screws or nuts, chipped paint, corrosion, or other defects.

(2) Tighten any loose screws and replace missing screws. Remove any corrosion dust, dirt, or grease; paint the outer portions of the adapter if necessary.

b. Internal Visual Inspection.

(1) Remove the cover from the adapter and inspect for loose connections; cracked, frayed, or deteriorated insulation; loose fasteners, or wire strain caused by improper placement. Check for evidences of overheating, noting whether any of the parts are discolored or if the odor of burned insulating material is present.

(2) Solder any loose connections, replace defective wiring, tighten loose fasteners, and adjust wiring to relieve strain. Replace parts damaged by overheating.

CHAPTER 6
MAINTENANCE

Section I. TOOLS AND MAINTENANCE MATERIALS

127. Tools

a. The following tool equipments are required for maintenance of the teleprinters:

(1) Tool Equipment TE–50–B.
(2) Tool Equipment TE–111.

b. In addition to the above, the following tools are required for shop maintenance:

(1) Fractional and letter size drill sets.
(2) Tap and die sets (National Course and National Fine threads).
(3) Electric hand drill (¼-in. capacity).

128. Maintenance Materials

The required maintenance materials are listed in the following table.

129. Test Equipment

The following test equipment is required for maintenance.

a. Multimeter TS–352/U. This unit is used to test the circuits of the teleprinter.

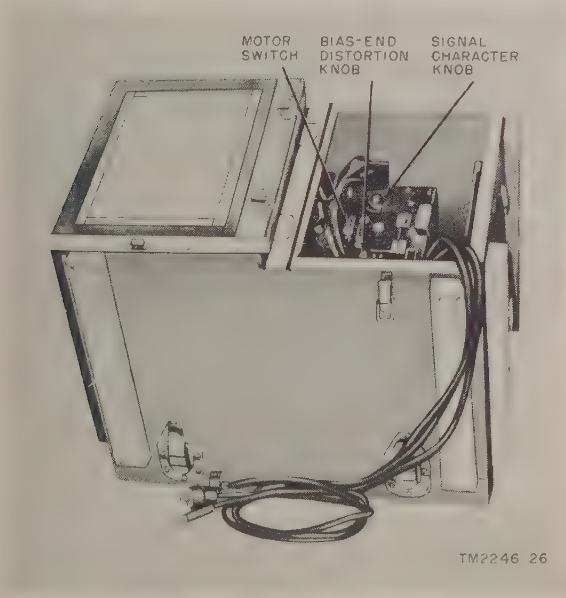


Figure 168. Test Set TS-2/TG.

b. Test Set TS–2/TG (fig. 168). This portable, motor-driven unit that transmits signals of constant distortion is used to test the selecting performance of teleprinters. The set transmits two types of distortion; marking or spacing bias, or marking or spacing end distortion. Any one of four test signals (R, Y, space, or a test message) can be transmitted continuously from the set. For complete instructions for using this test set, refer to TM 11–2208, Test Sets TS–2/TG, TS–2A/TG and TS–2B/TG (Teletypewriter Signal Distortion).

Item	Signal Corps stock No.
Orange stick	6Z7360.
Brush, toothbrush style	53–B–121610 (Quartermaster item).
Cheesecloth, bleached, 36 in. wide.	6Z1989.
Cloth, emery, crocus, 9 x 11 in. sheets.	6Z2000.
Cleaning Compound	7930–395–9542.
Paper, cleaning, Bell Seal Bond, ¼ x 2½-in.	6M750.
Sand paper, flint, No. 0000, 9 x 10-in.	6Z7500–0000.
Solvent, Dry Cleaning (SD), Federal spec. No. P–S–661a.	51–S–4385–1 (Quartermaster item).
Compound, antiseize	CE–52–2724.50000.080 (Corps of Engineers item).
Brush, sash, 1 x ⅝ in.	6Z1567.
Tape TL–192	6N8692.
Tape TL–83	6N8583.
Grease	6G650.
Oil, lubricating	6G1325.
Oil, General Purpose, Low Temperature Lubricating (OGP).	14–0–2564–200 (Quartermaster item).

c. Distortion Test Set TS–383/GG (fig. 169). This is a motor-driven unit, used for analyzing signals transmitted by a teleprinter sending unit and for testing the effect of distortion on receiving

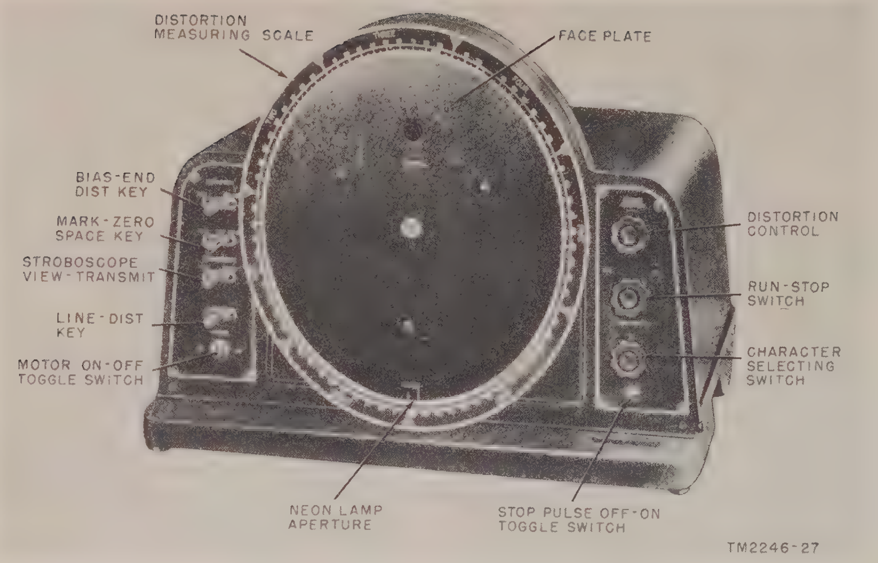

DISTORTION MEASURING SCALE
FACE PLATE
BIAS-END DIST KEY
MARK-ZERO SPACE KEY
STROBOSCOPE VIEW-TRANSMIT
LINE-DIST KEY
MOTOR ON-OFF TOGGLE SWITCH
DISTORTION CONTROL
RUN-STOP SWITCH
CHARACTER SELECTING SWITCH
NEON LAMP APERTURE
STOP PULSE OFF-ON TOGGLE SWITCH
TM2246-27

Figure 169. Distortion Test Set TS–383/GG.

mechansims. The distortion test set can transmit individual R, Y, T, O, M, V, blank and letters shift code combinations and a complete test message for testing the performance of the selecting mechanism. Signals transmitted by the teleprinter sending unit can be analyzed to detect deviation from the normal signal. For complete instructions for the use of this test set, refer to TM 11–2217, Distortion Test Set TS–383/GG and TS–383A/GG.

Section II. PREVENTIVE MAINTENANCE

130. Use of Preventive Maintenance Form

a. DA Form 11–253 (fig. 170) is to be used as directed by the local commander while performing preventive maintenance service on Teletypewriter Set AN/FGC–25(*).

b. Items not applicable to the AN/FGC–25(*) are lined out in figure 170. Reference in the ITEM block in the figure are to paragraphs in this manual which contain additional maintenance information pertinent to the particular item.

c. Although this form enumerates the readily accessible parts and surfaces requiring regular inspections for dirt, maladjustments, and signs of wear, it does not enumerate all of the many less accessible parts of the AN/FGC–25(*) that also require preventive maintenance care. When preventive maintenance routines are performed, check all parts for dirt, rust, corrosion, fungus, and ordinary signs of wear whether or not these parts are listed on the form.

d. The inspection intervals shown on the form are based on the assumption that the teleprinter will be in operation continuously 24 hours a day. Preventive maintenance inspections for signs of wear and maladjustment may be performed at slightly longer intervals if the teleprinter is not in continuous use.

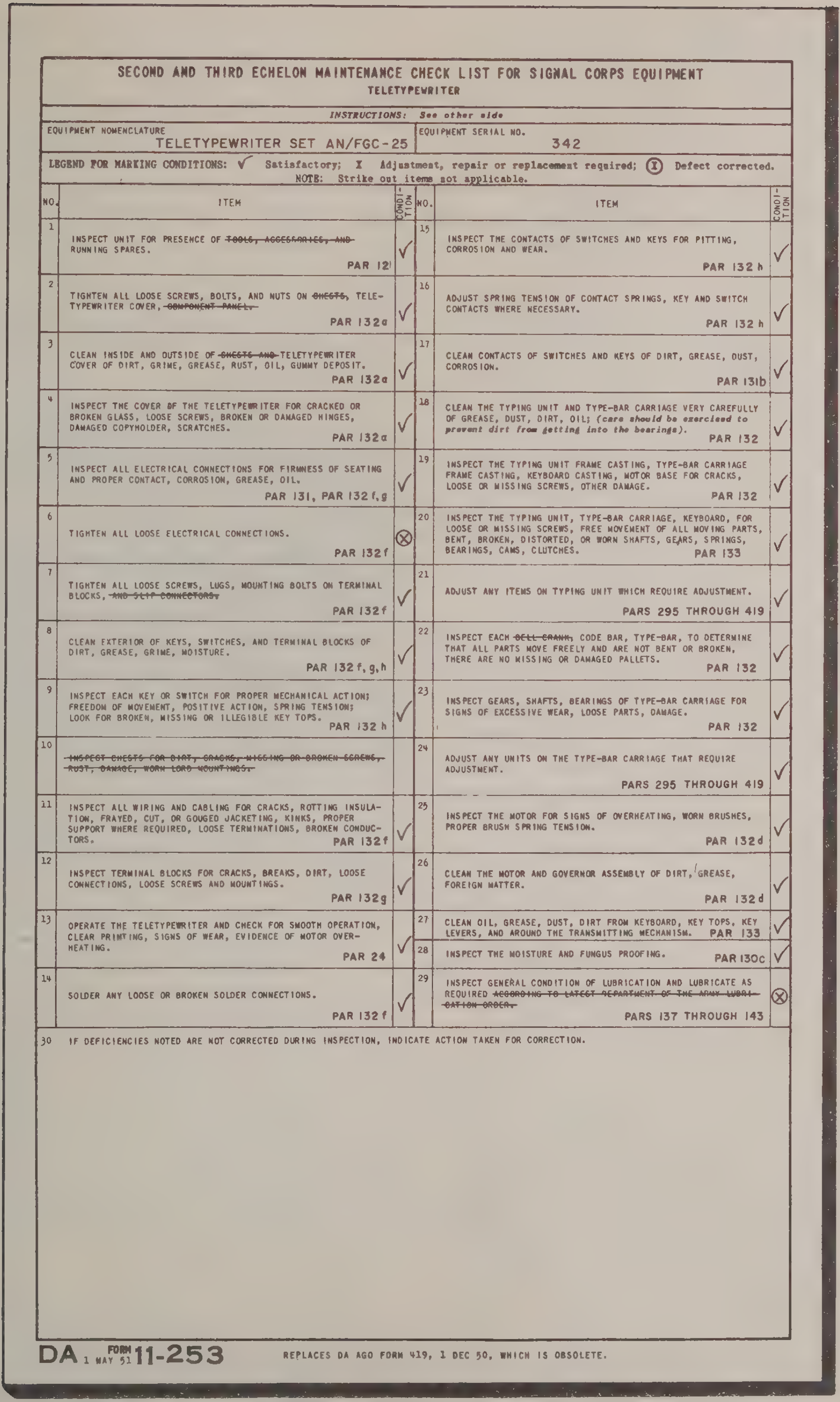
131. General Cleaning Instructions

Most preventive maintenance techniques pertain to specific areas of preventive maintenance, such as lubrication, and are thoroughly covered in later sections. However, the following general instructions should be helpful.

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning purposes.

- (1) When necessary, use a cloth moistened with solvent (SD) to clean metallic parts (except electrical contacts). Wipe the solvent and dirt from the part with a clean, dry cloth.
- (2) A flushing action normally is best when cleaning electrical contacts. Dip an orange stick in Cleaning Compound and allow the liquid to drip from the stick through the contacts. Remove the



SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
TELETYPEWRITER

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: TELETYPEWRITER SET AN/FGC-25
EQUIPMENT SERIAL NO.: 342

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ⊗ Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
1	INSPECT UNIT FOR PRESENCE OF ~~TOOLS, ACCESSORIES, AND~~ RUNNING SPARES. PAR 121	✓	15	INSPECT THE CONTACTS OF SWITCHES AND KEYS FOR PITTING, CORROSION AND WEAR. PAR 132 h	✓
2	TIGHTEN ALL LOOSE SCREWS, BOLTS, AND NUTS ON ~~CHESTS,~~ TELETYPEWRITER COVER, ~~COMPONENT PANEL.~~ PAR 132a	✓	16	ADJUST SPRING TENSION OF CONTACT SPRINGS, KEY AND SWITCH CONTACTS WHERE NECESSARY. PAR 132 h	✓
3	CLEAN INSIDE AND OUTSIDE OF ~~CHESTS AND~~ TELETYPEWRITER COVER OF DIRT, GRIME, GREASE, RUST, OIL, GUMMY DEPOSIT. PAR 132a	✓	17	CLEAN CONTACTS OF SWITCHES AND KEYS OF DIRT, GREASE, DUST, CORROSION. PAR 131b	✓
4	INSPECT THE COVER OF THE TELETYPEWRITER FOR CRACKED OR BROKEN GLASS, LOOSE SCREWS, BROKEN OR DAMAGED HINGES, DAMAGED COPYHOLDER, SCRATCHES. PAR 132a	✓	18	CLEAN THE TYPING UNIT AND TYPE-BAR CARRIAGE VERY CAREFULLY OF GREASE, DUST, DIRT, OIL; *(care should be exercised to prevent dirt from getting into the bearings).* PAR 132	✓
5	INSPECT ALL ELECTRICAL CONNECTIONS FOR FIRMNESS OF SEATING AND PROPER CONTACT, CORROSION, GREASE, OIL. PAR 131, PAR 132 f, g	✓	19	INSPECT THE TYPING UNIT FRAME CASTING, TYPE-BAR CARRIAGE FRAME CASTING, KEYBOARD CASTING, MOTOR BASE FOR CRACKS, LOOSE OR MISSING SCREWS, OTHER DAMAGE. PAR 132	✓
6	TIGHTEN ALL LOOSE ELECTRICAL CONNECTIONS. PAR 132f	⊗	20	INSPECT THE TYPING UNIT, TYPE-BAR CARRIAGE, KEYBOARD, FOR LOOSE OR MISSING SCREWS, FREE MOVEMENT OF ALL MOVING PARTS, BENT, BROKEN, DISTORTED, OR WORN SHAFTS, GEARS, SPRINGS, BEARINGS, CAMS, CLUTCHES. PAR 133	✓
7	TIGHTEN ALL LOOSE SCREWS, LUGS, MOUNTING BOLTS ON TERMINAL BLOCKS, ~~AND SLIP CONNECTORS.~~ PAR 132f	✓	21	ADJUST ANY ITEMS ON TYPING UNIT WHICH REQUIRE ADJUSTMENT. PARS 295 THROUGH 419	✓
8	CLEAN EXTERIOR OF KEYS, SWITCHES, AND TERMINAL BLOCKS OF DIRT, GREASE, GRIME, MOISTURE. PAR 132 f, g, h	✓	22	INSPECT EACH ~~BELL CRANK,~~ CODE BAR, TYPE-BAR, TO DETERMINE THAT ALL PARTS MOVE FREELY AND ARE NOT BENT OR BROKEN, THERE ARE NO MISSING OR DAMAGED PALLETS. PAR 132	✓
9	INSPECT EACH KEY OR SWITCH FOR PROPER MECHANICAL ACTION; FREEDOM OF MOVEMENT, POSITIVE ACTION, SPRING TENSION; LOOK FOR BROKEN, MISSING OR ILLEGIBLE KEY TOPS. PAR 132 h	✓	23	INSPECT GEARS, SHAFTS, BEARINGS OF TYPE-BAR CARRIAGE FOR SIGNS OF EXCESSIVE WEAR, LOOSE PARTS, DAMAGE. PAR 132	✓
10	~~INSPECT CHESTS FOR DIRT, CRACKS, MISSING OR BROKEN SCREWS, RUST, DAMAGE, WORN LORD MOUNTINGS.~~		24	ADJUST ANY UNITS ON THE TYPE-BAR CARRIAGE THAT REQUIRE ADJUSTMENT. PARS 295 THROUGH 419	✓
11	INSPECT ALL WIRING AND CABLING FOR CRACKS, ROTTING INSULATION, FRAYED, CUT, OR GOUGED JACKETING, KINKS, PROPER SUPPORT WHERE REQUIRED, LOOSE TERMINATIONS, BROKEN CONDUCTORS. PAR 132f	✓	25	INSPECT THE MOTOR FOR SIGNS OF OVERHEATING, WORN BRUSHES, PROPER BRUSH SPRING TENSION. PAR 132d	✓
12	INSPECT TERMINAL BLOCKS FOR CRACKS, BREAKS, DIRT, LOOSE CONNECTIONS, LOOSE SCREWS AND MOUNTINGS. PAR 132g	✓	26	CLEAN THE MOTOR AND GOVERNOR ASSEMBLY OF DIRT, GREASE, FOREIGN MATTER. PAR 132d	✓
13	OPERATE THE TELETYPEWRITER AND CHECK FOR SMOOTH OPERATION, CLEAR PRINTING, SIGNS OF WEAR, EVIDENCE OF MOTOR OVERHEATING. PAR 24	✓	27	CLEAN OIL, GREASE, DUST, DIRT FROM KEYBOARD, KEY TOPS, KEY LEVERS, AND AROUND THE TRANSMITTING MECHANISM. PAR 133	✓
			28	INSPECT THE MOISTURE AND FUNGUS PROOFING. PAR 130c	✓
14	SOLDER ANY LOOSE OR BROKEN SOLDER CONNECTIONS. PAR 132f	✓	29	INSPECT GENERAL CONDITION OF LUBRICATION AND LUBRICATE AS REQUIRED ~~ACCORDING TO LATEST DEPARTMENT OF THE ARMY LUBRICATION ORDER.~~ PARS 137 THROUGH 143	⊗

30 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 11-253 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

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Figure 170. DA Form 11-253.

Cleaning Compound carefully with a clean, dry cloth.

Caution: Prolonged breathing of Cleaning Compound is dangerous. Make certain that adequate ventilation is provided. Cleaning Compound is flammable; do not use near a flame.

c. If available, vacuum cleaning equipment is suitable for removing loose dust, paper lint, and dirt from teleprinters.

d. Parko-lubrized and parkerized parts (those parts with a black finish) must not be kept in solvent (SD) for any extended period because the protective, impregnated oils and waxes will be removed. Clean all parko-lubrized and parkerized parts with an oil-soaked, lint-free cloth. Treat the parts after cleaning with Oil, General Purpose, Low Temperature, Lubricating (OGP) stock No. 14–0–2564–200. This light weight preservative oil is to be used because it has no harmful effects on finishes, rubber, plastics or paint.

Note. The instructions given below cover those parts which cannot be cleaned by the general scrubbing method.

e. Oil-impregnated bronze (oilite) bearings and other parts must not be immersed in solvent (SD) or the impregnated oils will become dissolved. To clean, use a stiff brush or wipe with an oil-soaked cloth.

f. All ball bearings used on the teleprinter set are sealed. Make no attempt to clean or lubricate them, other than wiping with a clean, dry cloth. Discard any bearings that do not spin freely.

g. Clean the metal parts of the platen with a cloth dampened with solvent (SD). Clean the rubber platen and the plastic paper roller with soap and water; wipe off a clean, dry cloth.

h. Motors should be cleaned as follows:

(1) Use a clean, dry sash brush to remove dust and dirt from the exterior of the motor. Remove all oil and gummy deposits with a clean, lint-free cloth dampened with solvent (SD).

(2) To clean the internal parts of the motors; disassemble the motor. Remove all dust and dirt from the motor with a clean dry, sash brush.

Caution: Take care not to damage the windings.

(3) Clean all oil, greasy, or gummy deposits from the armature and field with a clean piece of cheese cloth or other lint-free cloth dampened lightly with solvent (SD). Do not use an excessive amount of solvent (SD).

(4) Clean all parts made entirely of metal by immersing in a container of solvent (SD).

Note. Do not remove discoloration from the commutator caused by imbedded particles of carbon unless the brushes spark excessively.

i. Clean the coils of the selector-magnet with a cloth dampened in solvent (SD). Clean rust off the pole pieces with No. 0000 sandpaper, then recoat with a thin film of lacquer.

j. Remove dust and dirt with a clean, dry sash brush, and remove all oil and gummy deposits with a clean cloth.

k. Discard any dirty or gritty felt friction plates. Do not clean by immersing in solvent (SD). When overhauling the equipment, replace all felt washers with new ones regardless of condition.

132. Preventive Maintenance, General

The preventive maintenance services can be performed on the teleprinter as a unit, removing the entire unit from service, or the page printer and the perforator may be serviced independently leaving the other machine connected to the signal line. The procedure to be followed depends upon local conditions. Before starting the preventive maintenance check, disconnect the unit from the signal line. Disconnect the power cord, remove the dust cover, and remove the chassis of the unit to be checked from the base. Check the unit as follows:

a. Dust Covers.

(1) Remove and inspect the dust covers thoroughly. Look for dents, cracks, marred painted surfaces, loose or missing screws, and faulty hinges. See that the copy holder is in good condition.

(2) Check all visible screws for tightness.

(3) Clean the outer surfaces of the dust covers with a piece of cheesecloth slightly dampened with water. To remove oil, grease, or gummy stains on the surface of the cover, moisten the cloth with a little solvent (SD).

b. Table.

(1) Inspect the table for breaks and cracks. Look for marred painted surfaces, missing or loose screws, dust, and dirt.

(2) Clean the painted surfaces with a piece of cheesecloth moistened with solvent (SD).

c. Preventive Maintenance for Teleprinter Bases.

(1) Clean the bases thoroughly with a clean cloth. Wipe away all deposits of oil or grease that may have dropped from the mechanical assemblies. Use a clean brush to remove all loose dirt and paper lint from hard-to-reach places. If deposits are difficult to remove with a dry cloth, moisten the cloth with solvent (SD).

(2) Perform the preventive maintenance for cords, cables, wiring, terminal boards, switches as instructed in *f*, *g*, and *h* below.

d. Preventive Maintenance for Motors.

(1) The motors should turn freely, smoothly, and quietly when turned by hand or when under power. Check the motor unit for evidence of overheating. This may be indicated by discoloration or by an odor of burned insulating material.

(2) Clean the motors as instructed in paragraph 133*e*. Check to see that the wires leading to the motor are intact and clean.

(3) Apply any necessary lubrication to the motor governor lubrication points listed in section III of this chapter.

e. Preventive Maintenance for Power Supply Unit.

(1) Inspect for loose connections, damaged or broken parts, and defective or burned-out wiring. Look for evidences of overheating, noting whether the transformer or rectifying stack appear to be discolored. Check to be sure that there is a spare fuse in the spare fuse holder.

(2) Tighten all loose screws, bolts, nuts, cable clamps, etc. Solder any loose or broken connections. Check the condition of the flexible transformer taps.

(3) Use a suitable brush, cheesecloth, and a vacuum cleaner, if available, to remove dust and dirt. Remove oily and gummy deposits with a cloth dampened with solvent (SD). Remove all rust spots. Repaint all exposed metal surfaces.

f. Preventive Maintenance for Cords, Cables, and Wiring.

(1) Check wiring for cracked or deteriorated insulation, frayed or cut insulation at connecting or support points, kinks, or strain caused by improper placement.

(2) Tighten loose fasteners, clamps, and wiring connections. Repair loose or broken connections. Remove corrosion, rust, dirt, or dust from ground connections. Be sure that the outer insulation cover on cords and cables is wiped clean. Never use oil or solvent (SD) on rubber insulation. Renew the weatherproof coating on any fabric-covered wires requiring it.

(3) Adjustment of wiring normally is confined to arranging it so that it does not interfere with the operation of mechanical parts. Resolder loose connections and replace worn or damaged wiring.

g. Preventive Maintenance of Terminal Boards.

(1) Terminal boards used as receiving, connecting, and distributing points for electrical circuits usually are made of a strip of insulating material and one or more types of electrical connectors. These devices may be solder or screw-type terminals, contact springs, or contact lugs. They normally require little preventive maintenance unless wiring is changed. Inspect the terminal boards for cracks, breaks, and loose connections or mounting screws. Examine the connections for mechanical defects (broken or stripped screws and threads), dirt, grease, and corrosion. Tighten loose screws, lugs, and mounting bolts. Be extremely careful not to strip the threads by exerting too much force. Use tools of the correct size. Solder loose or broken connections.

(2) Wipe off any moisture with a clean cloth and brush off dirt and dust with a clean, dry brush. When necessary, terminal strips may be cleaned with a cloth moistened with solvent (SD). However, take care that the solvent does not come into contact with the insulation of the wires leading into the terminal strip. Remove and clean corroded connections. Use cleaning compound to clean electrical contact surfaces on all connecting devices.

h. Preventive Maintenance for Switches.

(1) Check the mechanical action of each switch. Look for dirt or corrosion. Operate each switch to see that it moves freely. Note the amount of spring tension and inspect for insufficient contact pressure when applicable. Tighten loose

screws, lugs, or mounting bolts. Remove loose connections that are dirty or corroded and clean them before tightening or soldering.

(2) Wipe off any moisture present. Carefully clean the exterior surfaces of the switches with a clean, dry brush. Use a burnishing tool to polish contact surfaces after cleaning with abrasives, such as No. 0000 sandpaper, crocus cloth, or a contact file. If contacts are pitted, or burned, use a contact file to restore the surfaces and then polish them with a burnishing tool. Take care not to remove too much metal. Clean the contacts with Cleaning Compound.

133. Preventive Maintenance for Keyboard Transmitter

a. With the keyboard transmitter removed from the page printer, inspect for the following:

(1) Cracks or other damage to the keyboard transmitter frame and any mechanical linkages.

(2) Loose, missing, worn, or broken nuts, bolts, screws or fastenings and electrical connections. Frayed, broken, or oil-soaked wiring or insulation.

(3) Levers, pawls, latches, code bars, springs, bearings, etc. Check to see that all parts move freely and are not damaged or broken.

(4) Missing, broken, or illegible keytops.

(5) Missing, broken, or distorted springs.

(6) Worn, burned, or dirty contacts and insulation in the sequential transmitter mechanism.

(7) Dirty, burned, or pitted printed circuit in the simultaneous transmitter mechanism.

b. Do not tighten the parts that require clearance or tension adjustments. Tighten all screws and bolts that are not part of an adjustment.

c. Clean the keyboard transmitter as follows:

(1) Clean the keytops with a cloth moistened with water.

(2) Blow out or brush away dirt or dust that may have accumulated in the keyboard transmitter mechanism and around the mechanical levers and code bars.

(3) Burnish or file contacts of the sequential transmitter mechanism if they are dirty, built-up, or pitted. Clean them thoroughly with cleaning compound after filing or burnishing.

(4) Clean a dirty printed circuit with a cloth dampened with cleaning compound.

(5) Smooth any sharp or pitted contact points on the shunting switches of the simultaneous transmitter with No. 0000 sandpaper. Clean points thoroughly with a cloth dampened with cleaning compound.

(6) Lubricate the keyboard transmitter as described in paragraphs 137 through 144.

134. Preventive Maintenance for Page Printing Mechanism

a. Examine all operating mechanical assemblies for signs of wear, lack of lubrication, accumulations of dirt or grime, and undesired looseness of any operating parts.

b. Clean all assemblies to remove any lubricant that may have dripped from lubrication points. This check provides the technician with a good indication as to whether too much lubricant was applied during the last routine servicing.

c. Check the condition of the inking ribbon. If the top edge of the inking ribbon appears frayed and the rest of the inking ribbon is serviceable, check the ribbon lifter adjustment as described in the adjustment section of this chapter.

d. Check the type pallets for dirt deposits in the character symbols. To clean the pallets, carefully insert a piece of paper between the type bars and the type bar back stop and brush lightly with a toothbrush-style brush slightly dampened with Solvent (SD). Check the small center areas of letters such as O, Q, D, G, B, P, and R to make certain that no dirt remains.

e. Lubricate the assemblies as instructed in paragraphs 137 through 144. Remove excess lubricant.

135. Preventive Maintenance for Transmitter-Distributor

a. Inspect the transmitter-distributor for the following:

(1) Loose, missing, or broken screws, bolts, fastenings, and electrical connections; frayed or broken wire insulation, and oil-soaked wiring and insulation.

(2) Worn or broken levers, pawls, latches, springs, bearings, etc. Check to see that all parts move freely without binding.

(3) Missing, broken, or distorted springs.

(4) Worn, dirty, or burned contacts in the transmitter-distributor transmitter contact assembly.

b. Do not tighten any parts that require clearance or tension adjustments. Tighten all screws that are not part of an adjustment.

c. Clean the transmitter-distributor as follows:

(1) Blow out or brush away any dirt or paper dust that may have accumulated in the transmitter mechanism, sensing levers, and feed mechanism.

(2) Burnish or file transmitter-distributor transmitter contacts if they are dirty, built-up, or pitted.

d. Lubricate the transmitter-distributor as instructed in paragraphs 137 through 144.

136. Preventive Maintenance for Perforator Printing and Punching Mechanism

a. Examine all operating assemblies for wear, lack of lubrication, accumulations of dirt or grime, and undesired looseness of operating parts.

b. Clean all assemblies to remove any lubricant that may have dripped from lubrication points. This check provides the technician with a good indication as to whether too much lubricant was applied during the preceding maintenance check.

c. Check the condition of the inking ribbon. Replace it if necessary. If the one edge of the ribbon appears to be frayed and the rest of the inking ribbon is still serviceable, check the ribbon guides for proper alinement.

d. Check the pulsing mechanism and the actuated switch for worn, burned, or builtup contacts.

e. Do not tighten any parts that require clearance or tension adjustments. Tighten all screws that are not part of an adjustment.

f. Clean the perforator printing and punching mechanism as follows:

(1) Blow out or brush away dirt and paper dust that may have accumulated around the printing and punching mechanisms.

(2) Check the characters on the type wheel for dirt deposits. To clean the type wheel, remove the ribbon from the guides and insert a piece of paper under the type wheel. With the type wheel in the forward position, brush lightly with a toothbrush-style brush moistened with solvent (SD). Brush toward the front of the perforator to prevent splattering dirt particles into the operating mechanism. Wipe the cleaned portion with a clean cloth. Rotate the type wheel and repeat the process until the entire wheel has been cleaned.

(3) After performing all other maintenance checks listed on DA Form 11-253, lubricate the assemblies as instructed in paragraph 137 through 144.

Section III. LUBRICATION, RUSTPROOFING AND PAINTING

137. Recommended Lubricants

The only lubricants recommended for lubrication of these teletypewriter sets are—

a. Oil, lubricating, Signal Corps stock No. 6G1325 (1-qt. can).

b. Grease, Signal Corps stock No. 6G650 (1-lb container).

138. Recommended Lubrication Schedule

The following chart shows the recommended intervals for checking the lubrication of these sets. When checking, lubricate only those lubrication points which require lubrication. *Do not over lubricate.*

Set operating speed (wpm)	Operating periods			
	Up to 8 hours per day (days)	8 to 12 hours per day (days)	12 to 16 hours per day (days)	16 to 24 hours per day (days)
60	30	20	15	10
66	27	18	13	9
75	24	16	12	8
100	18	12	9	6

139. Preparation for Lubrication

To lubricate either the page printer or the perforator, take the unit to be lubricated out of service and partially disassemble it as outlined in *a* or *b* below. One unit can be removed from service for lubrication at a time, or both can be lubricated at the same time, as the situation warrants.

a. Page Printer Disassembly. To disassemble the page printer for lubrication, proceed as follows:

(1) Disconnect the motor and the line circuits.
(2) Remove the dust cover.
(3) Pull out the selector-magnet plug connection from the base.
(4) Remove the keyboard transmitter plugs and the motor-stop plug connections from the base.
(5) Unscrew the motor power lead from its base coupling.
(6) Remove the four screws and lockwashers mounting the page printer to the base.
(7) Lift the entire mechanism from the base.
(8) Remove the ribbon spools and inking ribbon.
(9) Remove the keyboard transmitter.
(10) Remove the indicator cover.
(11) Remove the transmitter contact covers.
(12) Remove the motor governor cover (series-governor motor only).

b. Perforator Disassembly. To disassemble the perforator for lubrication, proceed as follows:

(1) Disconnect the power and line circuits and disconnect the plug connections between the transmitter-distributor and the perforator base.
(2) Remove the left dust cover from the transmitter-distributor and remove the transmitter-distributor from the perforator frame.
(3) Remove the dust cover from the main unit, and the top and right dust covers from the transmitter-distributor.
(4) Remove the roll of tape from the tape supply reel.
(5) Remove the ribbon spools and inking ribbon.
(6) Unscrew the motor power lead plug from its base coupling.
(7) Remove the selector magnet plug and the receiving multisolenoid plug from the base.
(8) Remove the perforator latch coil plug and the pulsing contact assembly plug from the base.
(9) Remove the four socket head screws, lock washers, and ground straps that hold the perforator chassis to the mounts on the base; lift the entire chassis off the base.
(10) Remove the cover from the pulsing mechanism.
(11) Remove the motor governor cover (series-governed motor only).

c. Old Lubricants. Remove old grease and oil from points to be lubricated with a clean, dry, lint-free cloth. Wrap the cloth around the end of an orange stick or similar implement to remove old lubricants from hard-to-reach places.

140. Lubrication Instructions, Grease

Use the grease gun to apply grease to the gears and racks.

a. To fill the grease gun furnished as part of Tool Equipment TE–50–B, proceed as follows:

(1) Unscrew the lubricant tube from the cap casting.
(2) Place the open end of the lubricant tube over the opening in the filling washer in the can of proper lubricant. Press down on the lubricant tube until it is filled. If the cans of lubricant on hand are not equipped with filling washers, press the metal follower against the back end of the lubricant tube and fill the tube by using a clean wooden paddle or the fingers. Tamp the lubricant down solidly in the tube by pounding the closed end sharply against the palm of the hand. Continue to add lubricant, and tamp it until the tube is completely filled.
(3) Screw the lubricant tube back into the cap casting just enough to hold the tube in place. Insert a rod, screw driver, pencil, or similar object through the perforated end of the lubricant tube and press the metal follower into the tube to expel any air that may be trapped inside. When the lubricant begins to ooze past the threads, tighten the lubricant tube into the cap casting.

b. To operate the grease gun, proceed as follows:

(1) Operate the handle back and forth several times until the lubricant is pumped from the nozzle. The grease gun then is ready for use. If the lubricant does not flow from the nozzle in a solid stream when the handle is operated, all the air has not been expelled from the tube. Invert the gun and pound the cap casting end

against the palm of the hand to jar the lubricant into the pump cylinder.

(2) To grease the gears and racks, hold the nozzle of the grease gun against the gear and rack teeth at an angle of about 45°. Operate the handle until enough grease is ejected, and at the same time turn the gear, or move the nozzle along the rack to form a continuous ribbon of grease.

141. Lubrication Instructions, Oil

Apply oil with the oiler furnished with Tool Equipment TE–50–B or with a piece of wire approximately .025 inch in diameter.

a. To fill the oiler, unscrew the top and remove the pump. Fill the tube with the proper lubricant and replace the pump. Tighten the top. After filling the oiler, or when starting to use the oiler after it has been standing for some time, operate the pump handle until the oil is forced out of the nozzle; then adjust the stop beneath the pump handle for desired flow of oil. Turn the adjusting stop in a counterclockwise direction to reduce the flow of oil and in a clockwise direction to increase the flow of oil. Move the adjustable stop beneath the pump handle to one side to make the stop inoperative.

b. When wire is used, dip the wire one-half inch into the oil and touch the lubrication point to apply 1 or 2 drops of oil. In this way, the quantity of oil applied is more easily controlled and overlubrication can be avoided. Never use any oil other than the oil recommended in paragraph 135. Only enough oil need be applied to moving parts to cover rubbing surfaces. However, a small additional amount of oil will help in preventing corrosion and in washing away the products of wear. When the perforator has been completely lubricated, wipe away excess oil and visible dirt.

142. Detailed Lubrication Instructions for Page Printer

(figs. 171–183)

Points listed in *b* through *f* below are to be lubricated, the type of lubricant to be used, and the quantity to be applied. The item numbers are arranged according to the method of application, so that the page printer can be treated by one lubricant or by one method at a time in a systematic way. Items to be lubricated are shown as item numbers in figures 171 through 183.

a. Ball Bearings. All ball bearings in the teleprinter are sealed and do not require lubrication.

b. Gears and Racks. Wipe off the old grease from the gears and racks with a clean, dry, lint-free cloth, and apply grease as follows:

Fig. No.	Item No.	Name of part	Method and quantity
171	13	Carriage-return driven gears	Apply sparingly all around gear teeth.
172	10	Main shaft driving gears (inside cover)	Work grease around gears, cover gear teeth liberally.
173	2	Carriage rack driving gears	Apply sparingly all around gear teeth.
173	6	Function driven gear	Apply sparingly all around gear teeth.
173	7	Square shaft driving gear	Apply sparingly all around gear teeth.
173	20	Function staff driving gear	Apply sparingly all around gear teeth.
173	23	Carriage feed worm gear	Apply sparingly all around gear teeth.
173	25	Carriage return shaft drive gears	Apply sparingly all around gear teeth.
173	26	Transmitter shaft drive gears	Apply sparingly all around gear teeth.
176	3	Clutch yoke cams	Thin film of grease on the cam surfaces.
177	4	Ribbon drive gears	Apply sparingly all around gear teeth.
177	12	Guide rail	Apply sparingly to rack teeth.
179	4	Carriage feed and return driving rack	Apply sparingly to rack teeth.

c. Friction Clutches. Apply oil as shown in the following chart. Do not release the spring tension on friction clutches for periodic lubrication. If necessary to release the spring tension to provide a thorough cleaning during lubrication, loosen the clamping screw securing the spring positioning collars, turn the friction clutches by turning the motor by hand (or in the case of the transmitter friction clutch with keyboard removed, turn the clutch itself), and apply oil. After collars are oiled, set them to give approximately the required spring tension on each friction clutch, run the page printer without printing for about 5 minutes, and then operate on repeat space for about 5 minutes. When lubrication is completed, set the spring tension of the friction clutches in accordance with instructions in chapter 3.

Fig. No.	Item No.	Name of part	Method and quantity
171	2	Carriage-feed friction clutch	10 to 15 drops on each washer along periphery of feelt friction plates; apply sparingly to spring and driving collar.
171	11	Keyboard transmitter friction clutch	10 to 15 drops on each washer along periphery of felt friction plates; apply sparingly to spring and driving collar.
173	17	Selector friction clutch	10 to 15 drops on each washer along periphery of felt friction plates; apply sparingly to spring and driving collar.
173	18	Square shaft driving friction clutch	10 to 15 drops on each washer along periphery of felt friction plates; apply sparingly to spring and driving collar.

d. Oil Holes. Apply oil at the following oil holes:

Fig. No.	Item No.	Name of part	Method and quantity
173	4	Function shaft sliding clutch drum	At least 5 drops in hole on either side.
173	13	Code-ring cage	At least 5 drops in hole on top of central bearing sleever (underneath stop bars).
173	21	Carriage-feed driven gear	At least 5 drops in hole in hub.
179	7	Type selecting arm bearing cap	At least 5 drops in hole in bearing cap.

e. Sleeve Bearings. Apply oil at the following bearings:

Fig. No.	Item No.	Name of part	Method and quantity
171	7	Square shaft bearings	Several drops at either end of both bearings.
171	8	Platen frame pivot bearings	Several drops between pivot and bearings.
171	14	Carriage rack drive shaft bearing	Several drops at both ends of bearings.
172	5	Function selecting arm bearing	Several drops at both ends of bearings.
172	6	Printing bail blade shaft bearings	Several drops at either end of both bearings.
173	19	Transfer lever shaft bearings	Several drops at either end of both bearings.
174	6	Stop latch post	Several drops of oil at either end.
177	1	Platen shaft bearings	Several drops at either end of both bearings.

f. Moving Parts. Apply oil at the following places:

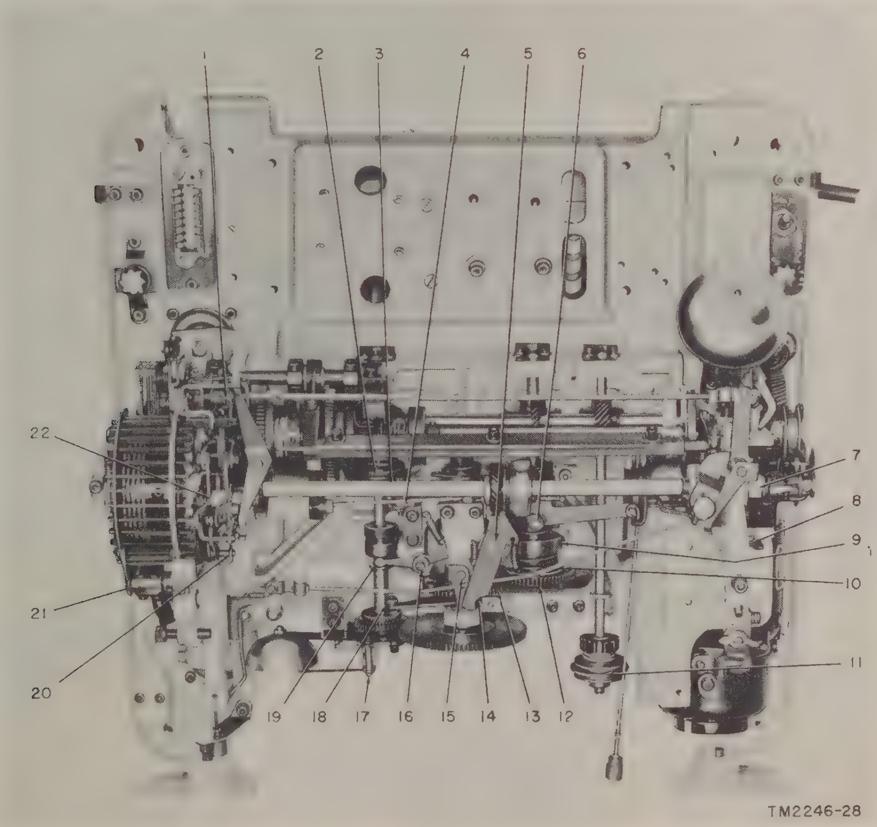
Fig. No.	Item No.	Name of part	Method and quantity
171	1	Stop bar shift blade	Apply sparingly to latching surface.
171	3	Square shaft	Thin film all sides, entire length.
171	4	Carriage feed pawl and ratchet wheel	Apply sparingly to teeth; 2 drops at each pawl pivot.
171	5	Carriage-return operating mechanism	2 drops at each pivot point.
171	6	Manual carriage-return mechanism	Apply sparingly to all pivots and rubbing surfaces.
171	9	Carriage return sliding clutch drum	Apply sparingly to teeth and annular grooves, 2 or 3 drops in each group of spline balls inside clutch.
171	10	Carriage-return safety clutch felt plates	Several drops around periphery of each washer.
171	12	Decelerating cam	Thin film on working surface.
171	15	Carriage-return clutch latch lever	2 drops on pivot; thin film on working surfaces.
171	16	Carriage-feed clutch lever	2 drops at pivot; thin film at each end.
171	17	Margin bell clapper and pawl	1 or 2 drops at each pivot point and at tip of pawl.
171	18	Carriage-feed clutch	Apply sparingly to clutch teeth.
171	19	Carriage-feed sliding clutch drum	Apply sparingly to rubbing surfaces.
171	20	Platen lower case latch	1 drop at pivot, apply sparingly to latching surface.
171	21	Code-ring locking bail shaft	1 drop at blade and cam follower locking lever.
171	22	Function bell crank pivots	Several drops between levers and washers.
172	1, 2	Paper guide link	1 drop at each end.
172	3	Function selecting arm	Apply sparingly to all working surfaces.
172	4	Stop bar shift lever	1 drop at pivot.
172	7	Stop bar shift link	Thin film.
172	8	Paper roller latch	1 drop at pivot.
172	9	Motor-stop actuating lever and signal bell clapper pivots.	2 drops at each pivot point.
172	11	Function cam follower	Apply sparingly to cam groove and bearing of roller.
172	12	Unshift and carriage feed levers	2 drops at each pivot.
172	13	Support lever	2 drops at each pivot.
172	14	Function punch bars	Several drops between bars and guide block.
172	15	Platen latch	2 drops at pivot; thin film on working surface, each end.
172	16	Aperture gate	2 drops in notch; several drops between gate and guide block.
173	1	Printing bail blade	Thin film both sides, along entire edge.
173	3	Clutch spring	Apply sparingly to clutch spring.
173	5	Function driven gear	Several drops at bearing and clutch teeth.
173	8	Delaying lever	1 drop at pivot.
173	9	Line feed and figures connecting links	2 drops at each end of both links.
173	10	Line feed and figures bell crank pivots	Several drops each.
173	11	Line feed and figures cam follower pivots	2 drops each.
173	12	Delaying latch	1 drop at pivot; apply sparingly to latching surface.
173	14	Code rings	Thin film all along inner and outer working surfaces of each code bar.
173	15	Line feed and figures cam followers	Apply sparingly to rollers, pivots, and all rubbing surfaces.
173	16	Line feed, figures and sensing lever restoring cams.	Thin film on all exposed surfaces.
173	22	Clutch latch	Apply sparingly to roller and latching surfaces.
173	24	Carriage-return blocking mechanism	1 or 2 drops at pivot; apply sparingly to latch surfaces.
173	27	Print cam follower	Apply sparingly to cam groove and bearing of roller and to spring hook.
174	1	Selector levers, bearings, and separating washers.	Apply sparingly to all rubbing and bearing surfaces.
174	2	XMTR contact E4 pivot	2 or 3 drops between arm and pivot studs.
174	3	Sensing lever locking bail	1 or 2 drops on bail surface and between lever and comb.
174	4	XMTR camshaft	Thin film on all cam lobes and stop teeth.
174	5	Cam-stop lever	1 or 2 drops at pivot; apply sparingly to latching surfaces.
174	7	Locking lever latch stud	2 or 3 drops at pivot points; thin film on latching surface.
174	8	Actuating link	2 drops at pivot point.
174	9	Function blocking bar spring	1 drop at each end; light film on spring surface.
174	10	Switch arm	1 or 2 drops at pivot point.

f. Moving Parts. Apply oil at the following places—Continued

Fig. No.	Item No.	Name of part	Method and quantity
175	1	Stop bars in code ring cage	2 drops at each end of all 35 stop bars.
175	2	Platen eccentric pivot	1 or 2 drops at pivot points.
175	3	Code ring locking shaft	1 drop at each pivot.
175	4	Detent wheel	Several drops at lever point; thin film on detent wheel teeth.
175	5	Single-double line feed lever	1 drop at pivot and detent surface.
175	6	T-lever	2 drops on bearing surface.
175	7	Code ring locking bail latching surface	Thin film on latching surface.
175	8	T-levers and separating washers	Apply sparingly to all rubbing and bearing surfaces.
175	9	Y-levers and detents	Apply sparingly to all rubbing and bearing surfaces.
175	10	Selector lever guide comb	Apply sparingly to all rubbing surfaces.
175	11	Selector magnet armature knife edge	Apply sparingly.
175	12	Selector levers, pivot bearings, and separating washers.	Apply sparingly to all rubbing and bearing surfaces.
175	13	Orientation lever pivot and rangefinding cam	1 or 2 drops. Thin film on cam surface.
175	14	Grooved pin in end of selector camshaft	Several drops between pin and camshaft.
175	15	Selector cams and stop plate	Thin film on working surfaces.
175	16	Transfer lever latch	2 drops on pivot; thin film on latching surface.
175	17	Transfer lever restoring cam	1 drop on cam surface.
175	18	Transfer lever roller	Apply sparingly to working surfaces.
175	19	Antibounce clutch	Several drops in clutch.
176	1	Link arm assembly	2 drops at pivot. Thin film all along notched edge of each bar.
176	2	Keyboard counter cam follower	2 drops at pivot.
176	4	Sensing levers	Apply sparingly at working surfaces at each end at pivot.
176	5	Ratchet pawl	2 drops at pivot.
176	6	Line indicator drive shaft pivots	2 drops at pivot.
176	7	Tabulator lever	2 drops at pivot.
177	2	Line feed pawl	2 drops at pivot.
177	3	Sprocket feed pins	1 drop on each pin.
177	5	Beam detent	1 drop at pivot; apply sparingly to latching surfaces.
177	6	Ribbon feed clutch	Apply sparingly to clutch teeth.
177	7	Ribbon drive shaft	Apply sparingly to bearings, cam surfaces, and gear teeth at both ends.
177	8	Ribbon sensing levers	1 or 2 drops at each bearing and pin.
177	9	Ribbon spool driving gears	Apply sparingly to annular groove, teeth, and driving jaws.
177	10	Ribbon spool drive shafts	1 or 2 drops at bearings, top and bottom.
177	11	Ball bearing and guide rail	Apply sparingly to rolling surfaces.
177	13	Manual letters mechanism	Apply sparingly to all pivots and rubbing surfaces.
177	14	Carriage return bell crank and vertical link	2 drops at each pivot.
177	15	Armature shaft	1 drop at pivot.
178	1	Key levers	1 drop at each pivot.
178	2	Code bar and studs	Thin film all along notched edge of each bar. 2 or 3 drops in each groove.
178	3	Space bar pivots	1 drop each.
178	4	Front key lever guide	1 drop in each key lever guide slot.
179	1	Ribbon shaft lock	1 drop at handle pivots.
179	2	Ribbon guide	Thin film on sliding surfaces.
179	3	Hinge pin	2 or 3 drops at each pivot; apply sparingly to gear teeth.
179	5	Ribbon lifter bell crank	1 or 2 drops at pivots.
179	6	Connecting bars guide plate	1 or 2 drops at each guide plate.
179	8	Type selecting arm	Apply sparingly between arm and claw.
179	9	Ribbon lifter bracket	1 or 2 drops at each pivot.
179	10	Ribbon lifter pivot bearing	Thin film on sliding surfaces.
180	1	Cam follower	1 or 2 drops at pivot point and working surface.
180	2	Tabulator shaft pivot	2 drops at pivot.
180	3	Ratchet wheel	Light coat on entire working surface.

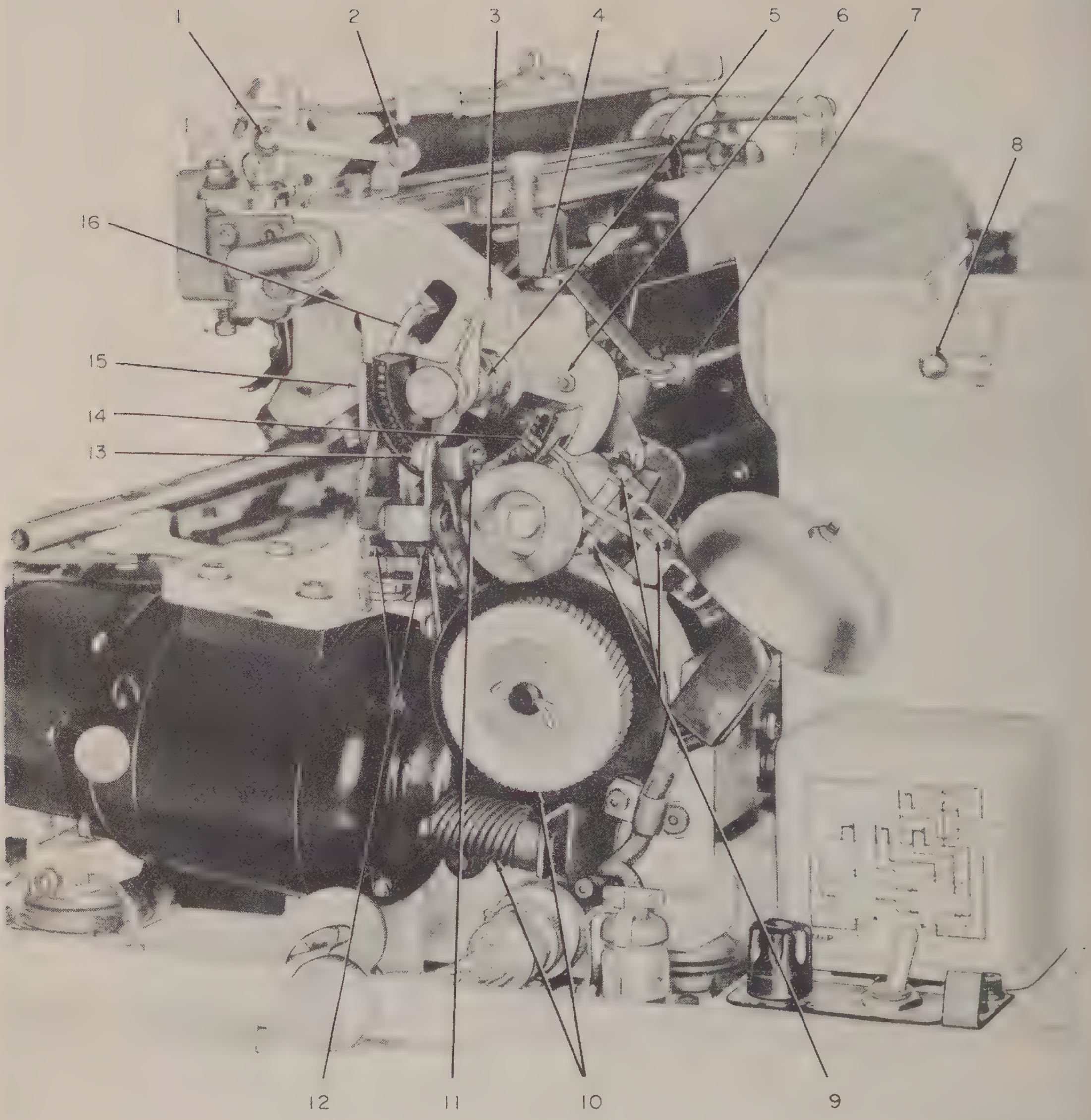
f. Moving Parts. Apply oil at the following places—Continued

Fig. No.	Item No.	Name of part	Method and quantity
180	4	Indicator carriage drive shaft	1 or 2 drops at pivots; light coat on the entire length of shaft.
180	5	Tab actuator arm	1 or 2 drops at pivot and working surface.
181	1	Indicator carriage	1 or 2 drops on roller and pivot points.
181	2	Tabulator locking lever	1 or 2 drops at pivot point and working surface.
182	1	Governor adjustment lever	1 or 2 drops at each end.
182	2	Governor adjustment screw	Apply sparingly to entire thread.
182	3	Motor-governor adjustment gear	Apply sparingly to gear teeth.
182	4	Governor worm	2 or 3 drops in governor hub opening
183	1	Transmitter lever post pivot	1 or 2 drops of oil at pivot point and working surface.
183	2	Lockup lever roller	1 or 2 drops on pin.
183	3	Cam arm	Slight film of oil on working surface.



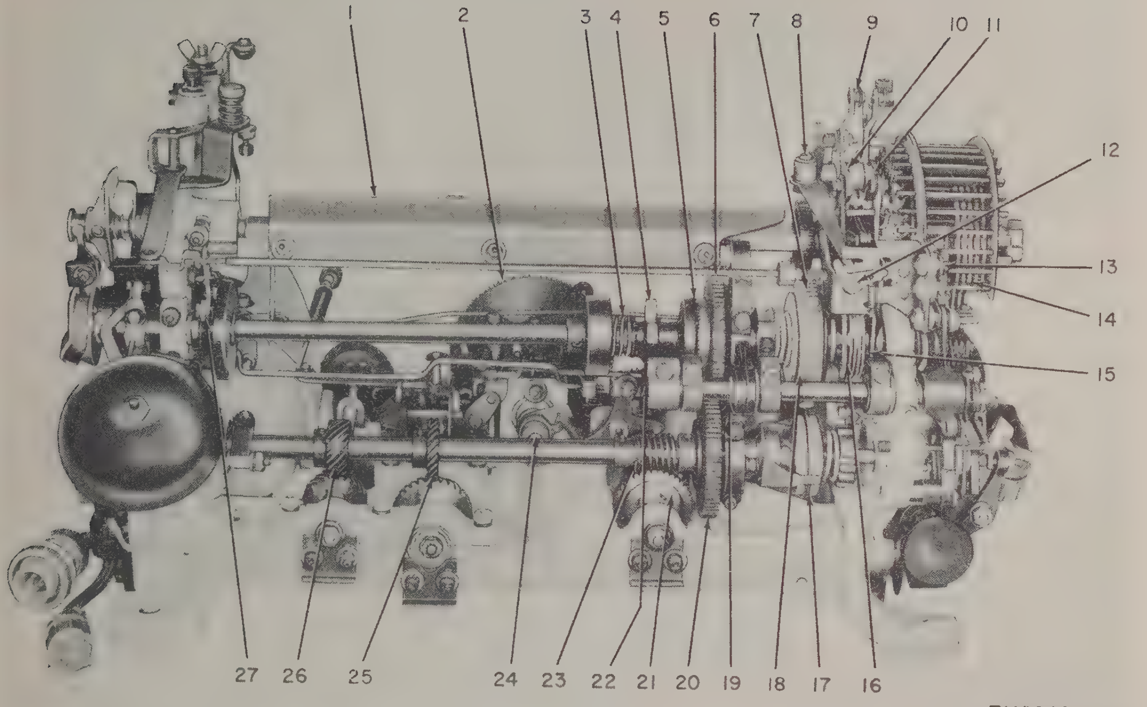
1 Stop bar shift blade
2 Carriage feed friction clutch
3 Square shaft
4 Carriage feed pawl and ratchet wheel
5 Carriage return operating mechanism
6 Manual carriage return mechanism
7 Square shaft bearing
8 Platen frame pivot bearing
9 Carriage-return sliding clutch drum
10 Carriage-return safety clutch felt plate
11 Keyboard transmitter friction clutch
12 Decelerating cam
13 Carriage-return driven gear
14 Carriage rack drive shaft bearing
15 Carriage-return clutch latch lever
16 Carriage-feed clutch lever
17 Margin bell clapper and pawl
18 Carriage-feed clutch
19 Carriage-feed sliding clutch drum
20 Platen lower case latch
21 Code-ring locking bail shaft
22 Function bell crank pivot

Figure 171. Carriage and platen of page printing mechanism removed to show lubrication points.



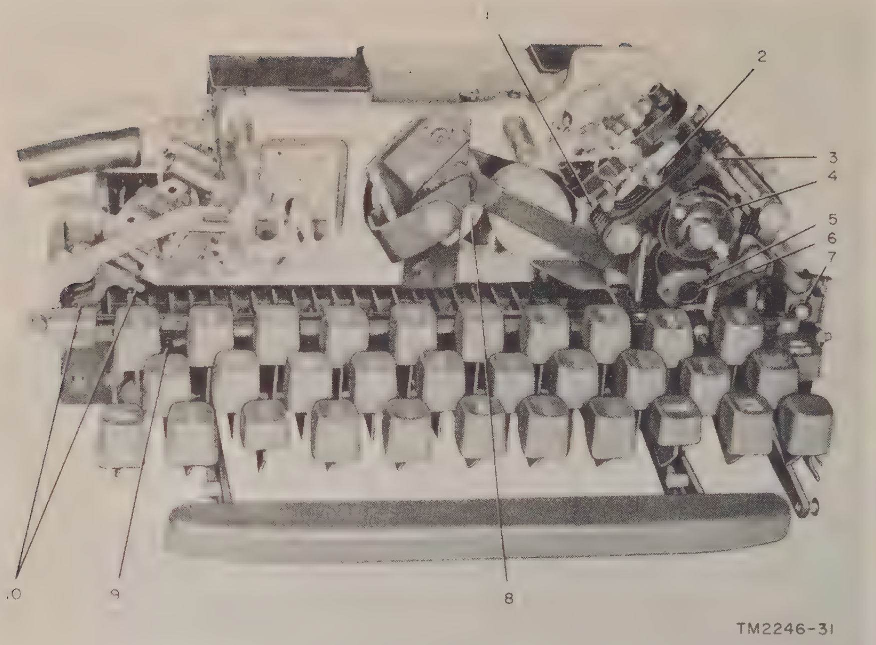
1	Paper guide link	7	Stop bar shift link	11	Function cam follower
2	Paper guide link	8	Paper roller latch	12	Unshift and carriage feed lever
3	Function selecting arm	9	Motor stop actuating lever and signal bell clapper pivot	13	Support lever
4	Stop bar shift lever	10	Main shaft driving gear (inside cover)	14	Function punch bar
5	Function selecting arm bearing			15	Platen latch
6	Printing bail blade shaft bearing			16	Aperture gage

Figure 172. Page printing mechanism, side view, showing lubrication points.



1 Printing bail blade
2 Carriage rack driving gear
3 Clutch spring
4 Function shaft sliding clutch drum
5 Function driven gear
6 Function driven gear
7 Square shaft driving gear
8 Delaying lever
9 Line feed and figures connecting links
10 Line feed and figures bell crank pivots
11 Line feed and figures cam follower pivots
12 Delaying latch
13 Code ring cage
14 Code ring
15 Line feed and figures cam followers
16 Line feed, figures, and sensing lever restoring cams
17 Selector friction clutch
18 Square shaft driving friction clutch
19 Transfer lever shaft bearing
20 Function shaft driving gear
21 Carriage-feed driven gear
22 Clutch latch
23 Carriage-feed worm gear
24 Carriage-return blocking mechanism
25 Carriage-return shaft drive gear
26 Transmitter shaft drive gear
27 Print cam follower

Figure 173. Rear view of page printing mechanism, showing lubrication points.



1 Selector lever, bearing, and separating washer
2 XMTR contact E4 pivot
3 Sensing lever locking bail
4 XMTR camshaft
5 Cam-stop lever
6 Stop latch cam post
7 Locking lever latch stud
8 Actuating link
9 Function blocking bar spring
10 Switch arm

Figure 174. Left front view of keyboard transmitter showing lubrication points.

1 Stop bars in code ring cage
2 Platen eccentric pivot
3 Code-ring locking shaft
4 Detent wheel
5 Single-double line feed lever
6 T-lever
7 Code-ring locking bail latching surface
8 T-lever and separating washer
9 Y-lever and detent
10 Selector lever guide comb
11 Selector-magnet armature knife edge
12 Selector lever, pivot bearing, and separating washer
13 Orientation lever pivot and range-finding cam
14 Grooved pin in end of selector camshaft
15 Selector cam and stop plate
16 Transfer lever latch
17 Transfer lever restoring cam
18 Transfer lever roller
19 Antibounce clutch

Figure 175. Selector side of page printing mechanism, showing lubrication points.

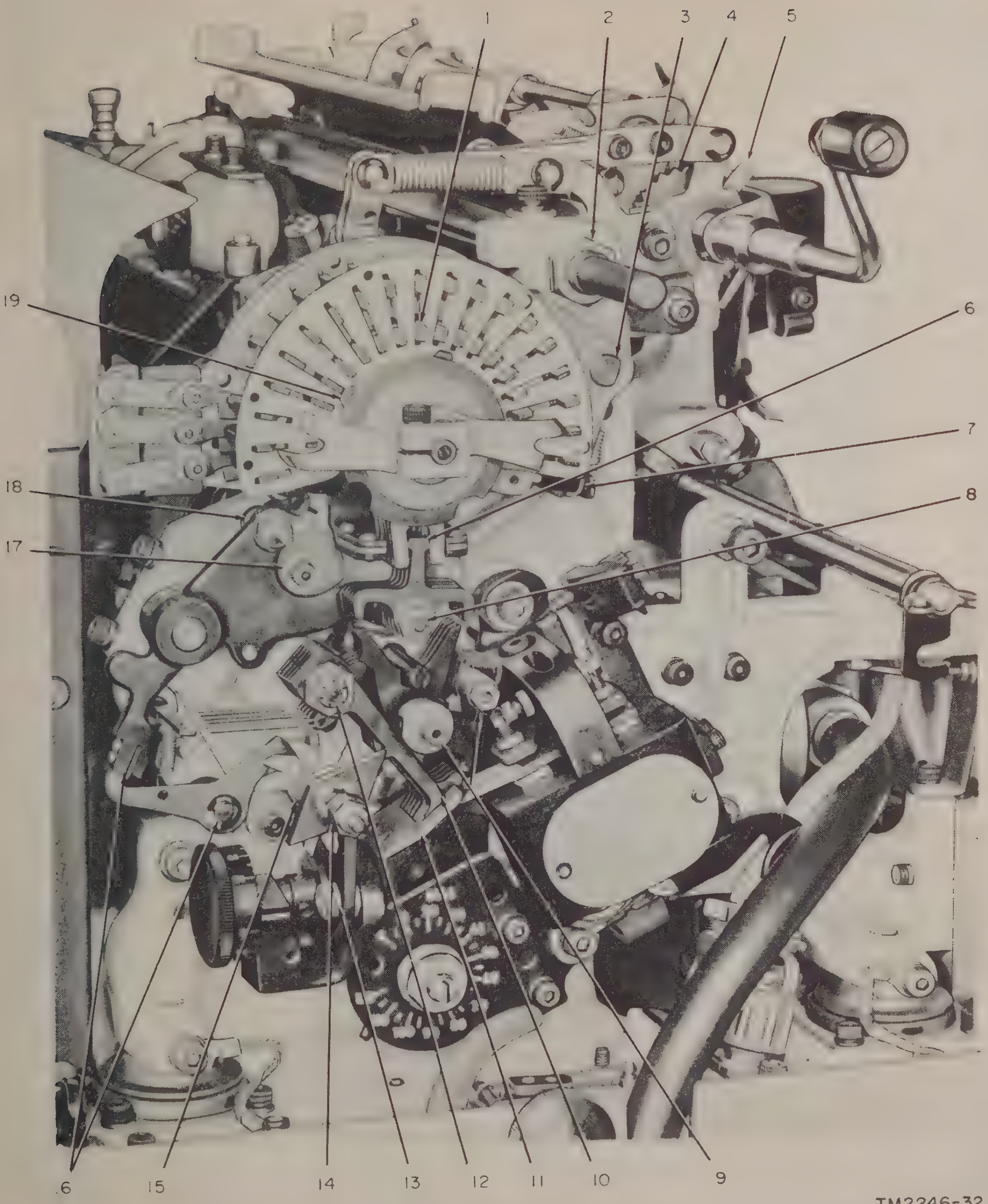
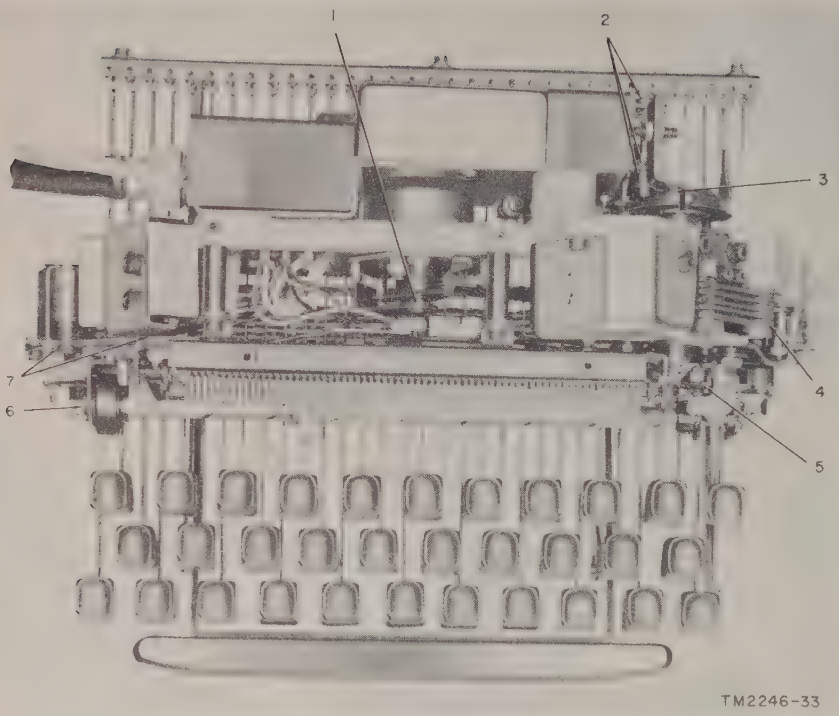
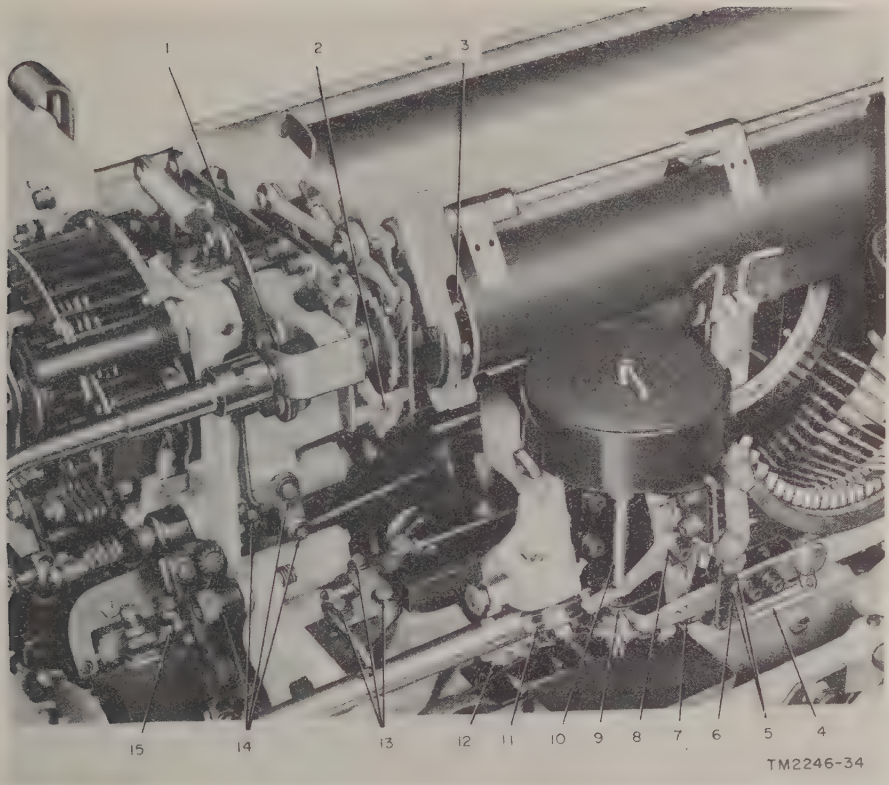


Figure 175—Continued.



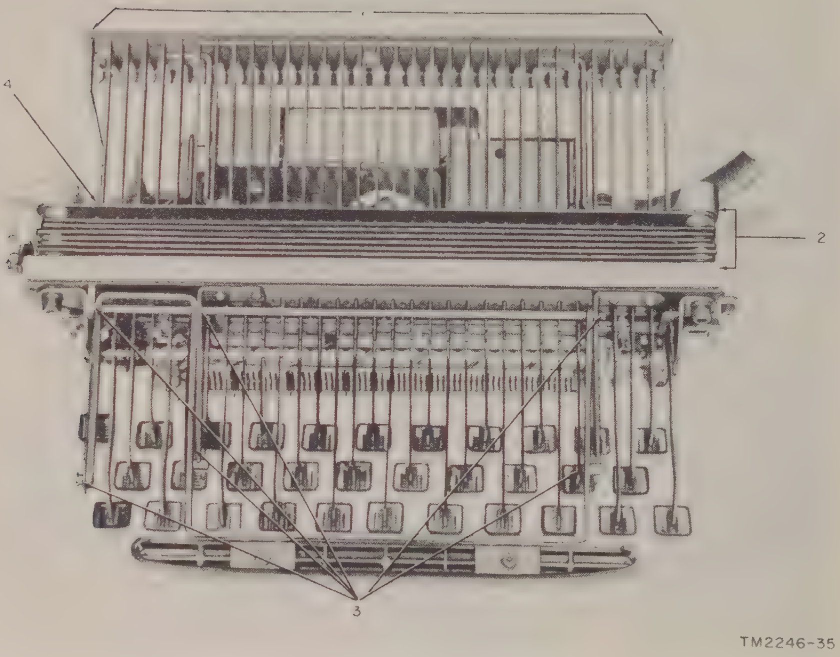
1	Link arm assembly	4	Sensing lever	7	Tabulator lever
2	Keyboard counter cam follower	5	Ratchet pawl		
3	Clutch yoke cam	6	Line indicator drive shaft pivot		

Figure 176. Keyboard transmitter, top view, showing lubrication points.



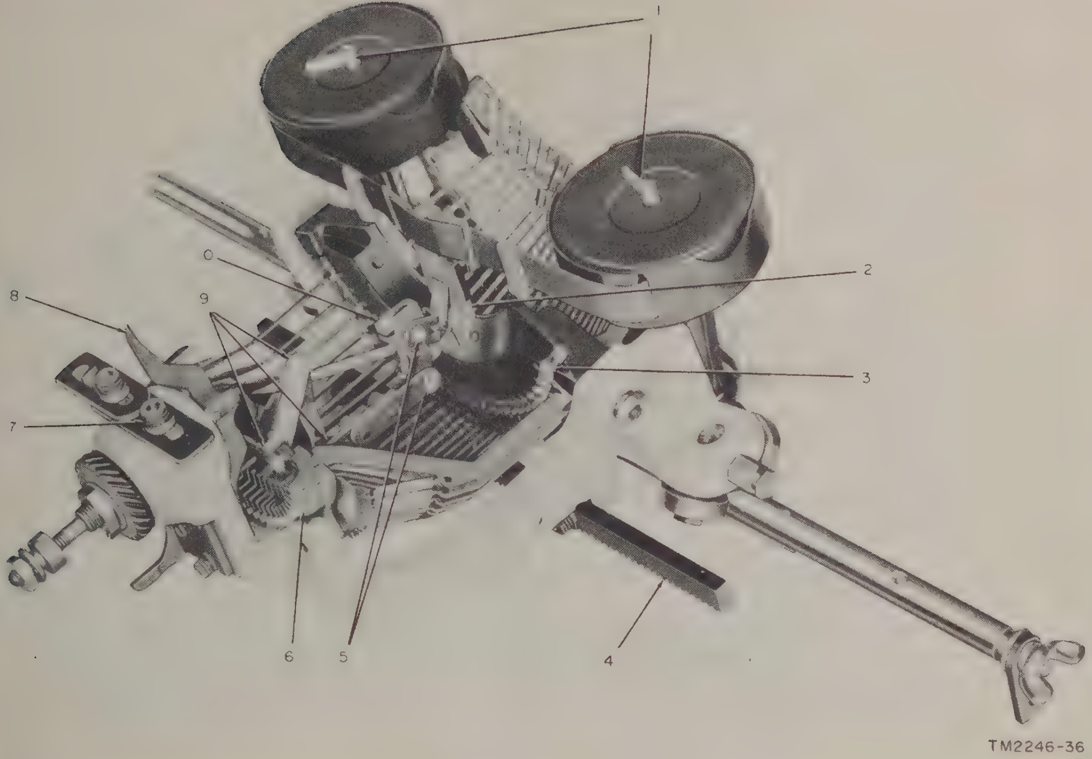
1	Platen shaft bearing
2	Line feed pawl
3	Sprocket feed pin
4	Ribbon drive gear
5	Beam detent
6	Ribbon feed clutch
7	Ribbon drive shaft
8	Ribbon sensing lever
9	Ribbon spool driving gear
10	Ribbon spool drive shaft
11	Ball bearing and guide rail
12	Guide rail
13	Manual letters mechanism
14	Carriage-return bell crank and vertical link
15	Armature shaft

Figure 177. Page printing mechanism, left front view, showing lubrication points.



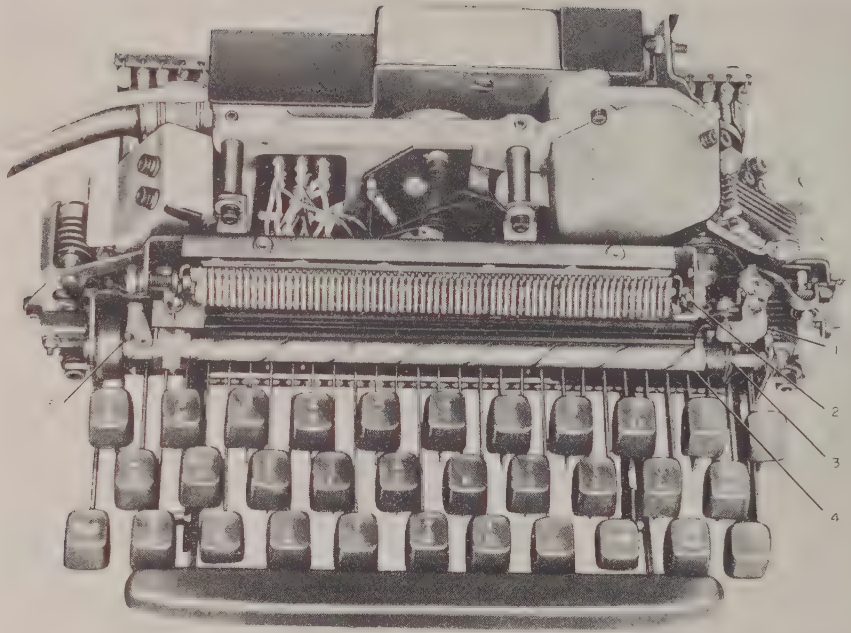
1 Key lever
2 Code bar and stud
3 Space bar pivot
4 Front key lever guide

Figure 178. Underside of keyboard transmitter, showing lubrication points.



1 Ribbon shaft lock
2 Ribbon guide
3 Hinge pin
4 Carriage feed and return driving rack
5 Ribbon lifter bell crank
6 Connecting bar guide plate
7 Type selecting arm bearing cap
8 Type selecting arm
9 Ribbon lifter bracket
10 Ribbon lifter pivot bearing

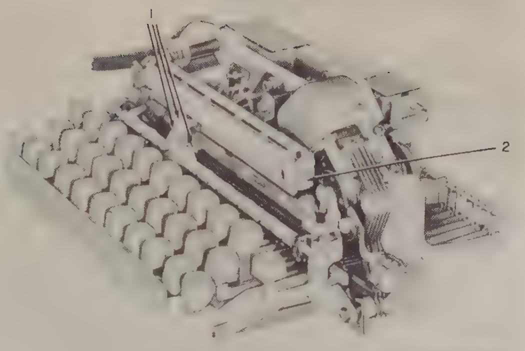
Figure 179. Page printing mechanism carriage, rear view, showing lubrication points.



TM2246-37

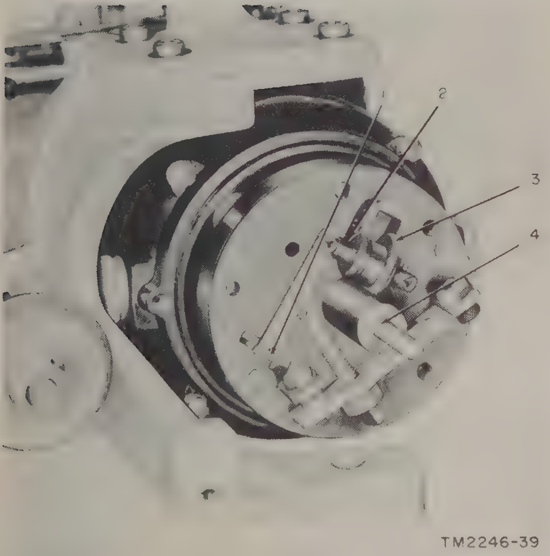
1 Cam follower
2 Tabulator shaft pivot
3 Ratchet wheel
4 Indicator carriage drive shaft
5 Tab actuator arm

Figure 180. Keyboard transmitter, front view, showing lubrication points.



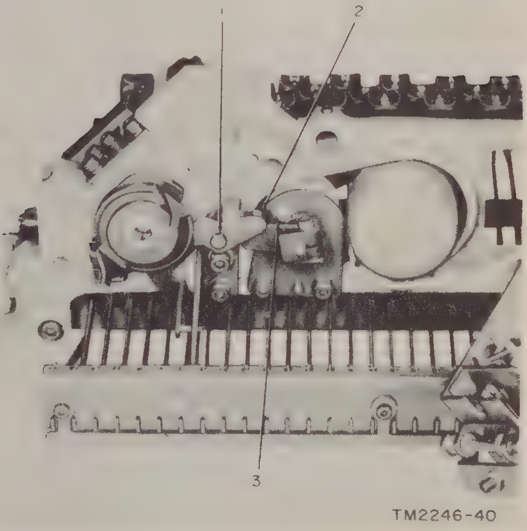
1 Indicator carriage 2 Tabulator locking lever

Figure 181. Keyboard transmitter, right front view, showing lubrication points.



1 Governor adjustment lever
2 Governor adjustment screw
3 Motor governor adjustment gear
4 Governor worm

Figure 182. Governor of series-governed motor, showing lubrication points.



1 Transmitter lever post pivot
2 Lockup lever
3 Cam arm

Figure 183. Keyboard transmitter, rear view, showing lubrication points

143. Detailed Lubrication Instructions for Perforator
(figs. 184–195)

a. Ball Bearings. All ball bearings of the perforator are sealed and do not require lubrication.

b. Gears. Wipe the old grease off the gears listed below with a clean, lint-free cloth, and apply grease as instructed.

Fig. No.	Item No.	Name of part	Method and quantity
184	11	Stop arm shaft driven gear	Apply grease sparingly around gear teeth.
184	12	Shaft drive gear	Apply grease sparingly around gear teeth.
184	14	Double gear	Work grease around gears; cover gear teeth liberally.
185	24	Type wheel hub gear	Apply grease sparingly around gear teeth.
185	27	Type wheel driven gear	Do not lubricate this gear.
188	7	Motor driven gear set	Work grease around gears, cover teeth liberally.
191	4	Power shaft gear	Apply grease sparingly around gear teeth.

c. Friction Clutches. Lubricate the friction clutches of the perforator listed below. When lubricating, follow the detailed instructions for lubrication of friction clutches as described in paragraph 139*c*.

Fig. No.	Item No.	Name of part	Method and quantity
184	13	Stop arm shaft friction clutch	10 to 15 drops of oil on each disk along periphery of felt friction plates; apply sparingly to spring and collar.
186	21	Transmitter-distributor drive shaft friction clutch.	10 to 15 drops of oil on each disk along periphery of felt friction plates; apply sparingly to spring and collar.
189	2	Selector camshaft friction clutch	10 to 15 drops of oil on disk along periphery of felt friction plates; apply sparingly to spring and collar.

d. Moving Parts. Apply oil at the following places:

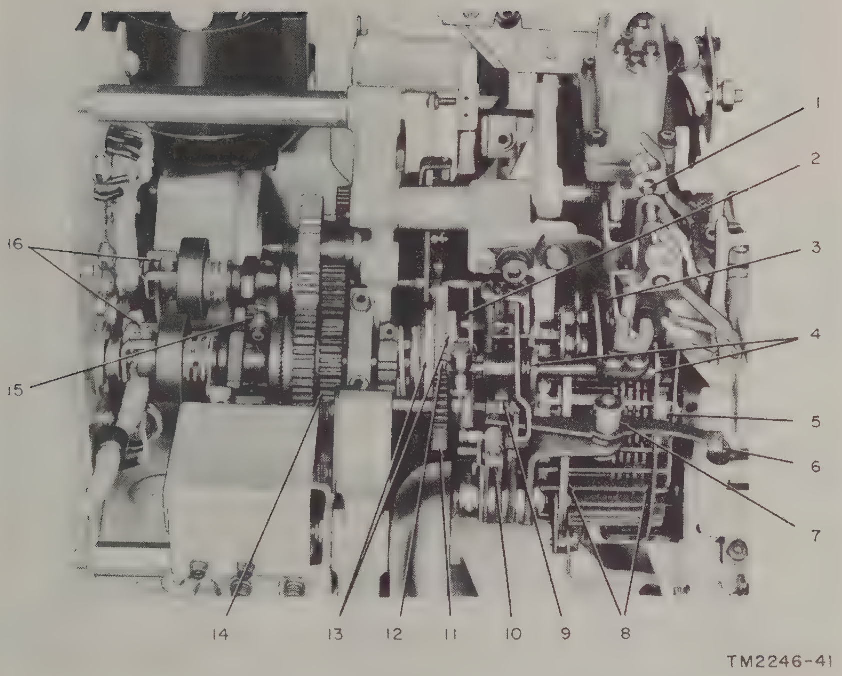
Fig. No.	Item No.	Name of part	Method and quantity
184	1	Ribbon retainer shaft	2 drops of oil on pivot points.
184	2	Type wheel and function lever cam	Apply thin film on studs.
184	3	Code-ring locking bail	Apply sparingly to latching surface.
184	4	Code-ring locking bail shaft	2 drops of oil on pivot points.
184	5	Stop arm shaft antibounce clutch	Several drops into clutch.
184	6	Type wheel upper bell crank lever	Apply sparingly to coupling of arm and type wheel transfer lever.
184	7	Type wheel reciprocating transfer lever eccentric stud.	2 drops at upper end of pivot.
184	8	Stop bars in code ring cage	2 drops at each end of all 32 stop bars.
184	9	Function sensing levers hub	Several drops between levers and washers.
184	10	Type wheel reciprocating lever assembly	2 drops at each shoulder pin and between levers and washers.
184	15	Clutch latch arm	Apply sparingly to bearing surfaces.
184	16	Pulsing camshaft fork	Slight film of oil on all bearing surfaces.
185	1	Driving link lever	Slight film of oil on bearing surfaces.
185	2	Code rings and T-levers engagement	Slight film of oil on all moving parts.
185	3	Manual tape feed-out link	Slight film of oil on bearing surfaces.
185	4	Receiving multisolenoid Y-lever stud	2 drops of oil on pivot point.
185	5	Code plate and T-lever engagement	Slight film of oil on all working surfaces.
185	6	T-levers and separating washers	Apply sparingly to all rubbing and bearing surfaces.
185	7	Y-levers detent	Apply sparingly to all rubbing and bearing surfaces.
185	8	Y-levers	Slight film of oil on all bearing surfaces.
185	9	Selector lever stop comb	Apply sparingly to all rubbing surfaces.
185	10	Selector cams and stop plate	Thin film on working surfaces.

d. Moving Parts. Apply oil at the following places—Continued

Fig. No.	Item No.	Name of part	Method and quantity
185	11	Rangefinder cam	Apply thin film on cam surface.
185	12	Transfer lever trip latch shaft	Apply sparingly at both ends of transfer trip latch shaft.
185	13	Selector levers and separating washers	Apply sparingly between levers and washers.
185	14	Transfer lever cam	Apply thin film on working surfaces of cam.
185	15	Transfer lever roller stud	1 drop between roller and lever.
185	16	Punch arm pivot post	Apply at least 5 drops of oil in oilhole of punch arm shaft.
185	17	Code hole punch lever pivot	Several drops between levers and washers.
185	18	Punch interference lever shaft	Thin film on working surfaces.
185	19	Code hole punch levers	Thin film on working surfaces.
185	20	Feed pawl pivot	1 drop at each end of the pivot.
185	21	Code punch bars	Slight film of oil on all moving surfaces.
185	22	Tape chute	2 drops of oil on slot.
185	23	Type wheel post	Apply 2 drops at each end of shaft. Slide type wheel in and out several times for even lubrication.
185	25	Type wheel lower bell crank lever	Apply sparingly to lower bell crank lever end.
185	26	Reciprocating lever shaft	2 drops to upper and lower bell crank shaft sleeves.
185	28	Type wheel upper bell crank lever	Apply sparingly to upper bell crank lever end.
185	29	Print and register arm	Apply sparingly to the cam groove and bearing of roller.
186	1	Code-ring locking bail shaft	Apply sparingly to all working surfaces and to pivot point of figures and letters latch.
186	2	Ribbon retainer shaft	Apply sparingly at retainer-shaft pivot points.
186	3	Ribbon spool latch	2 drops of oil on pivot post.
186	4	Ribbon spool shaft	2 drops of oil on bearing surface.
186	5	Ribbon reversing toggle assembly	Apply thin film on all working surfaces of toggle assembly.
186	6	Ribbon roller shaft	1 drop at each end of rollers.
186	7	Ratchet feed detent	Apply thin film on all working surfaces of ribbon feed pawl.
186	8	Sensing lever shaft	2 drops at each stud of sensing levers.
186	9	Ribbon feed pawl shaft	2 drops at each ratchet of shaft.
186	10	Ribbon feed cam follower stud	Apply sparingly at both ends of stud.
186	11	Ribbon feed cam	Apply thin film on cam.
186	12	Ribbon guide hub	2 drops on moving surface of pivot stud.
186	13	Paper guide lever pivot	2 drops of oil on all pivot points.
186	14	Manual tape feed-out shaft	2 drops at all pivot points.
186	15	Dust cover arm	2 drops of oil on pivot post.
186	16	Back space pawl	2 drops of oil on pivot post.
186	17	Detent lever roller	Thin film on surface of roller and a drop at each side.
186	18	Detent lever stud	1 drop at each end of pivot.
186	19	Punch interference levers	1 drop of oil between interference levers and washers.
186	20	Code rings	Thin film all along inner and outer working surfaces of each code ring. One drop between code rings and washers.
187	1	Type wheel register lever cam	Apply sparingly to cam groove.
187	2	Print hammer cam	Apply sparingly to cam groove.
187	3	Armature mounting shaft	Apply sparingly.
187	4	Grooved pin in end of selector camshaft	Several drops between pin and camshaft.
187	5	Switch operating lever	1 drop at pivot and latching surface.
187	6	Connecting link	1 drop at pivot points.
187	7	Print and register levers shaft	Apply sparingly to all working surfaces of levers.
187	8	Tape feed sprocket	2 drops in each hole on both sides of sprocket.
187	9	Tape retainer assembly	1 drop at each pivot of tape retainer.
188	1	Reciprocating and restoring cam followers	Apply sparingly to roller, pivots, and all rubbing surfaces.
188	2	Stop arm shaft support plate	1 drop each side of collar.
188	3	Latch lever pivot	2 drops of oil on pivot.
188	4	Clutch release lever	Slight film of oil on all bearing surfaces.
188	5	Transfer lever shaft bearings	1 drop between collars and bearings on transfer lever shaft.
188	6	Clutch latch	2 drops on pivot; thin film on latching surface.
189	1	Code actuated switch cam	Slight film of oil on camming surface.
190	1	Alarm lever hub	Apply sparingly at both ends of hub.
190	2	Switch actuating arm latch pivot	Apply sparingly at both ends of pivot.

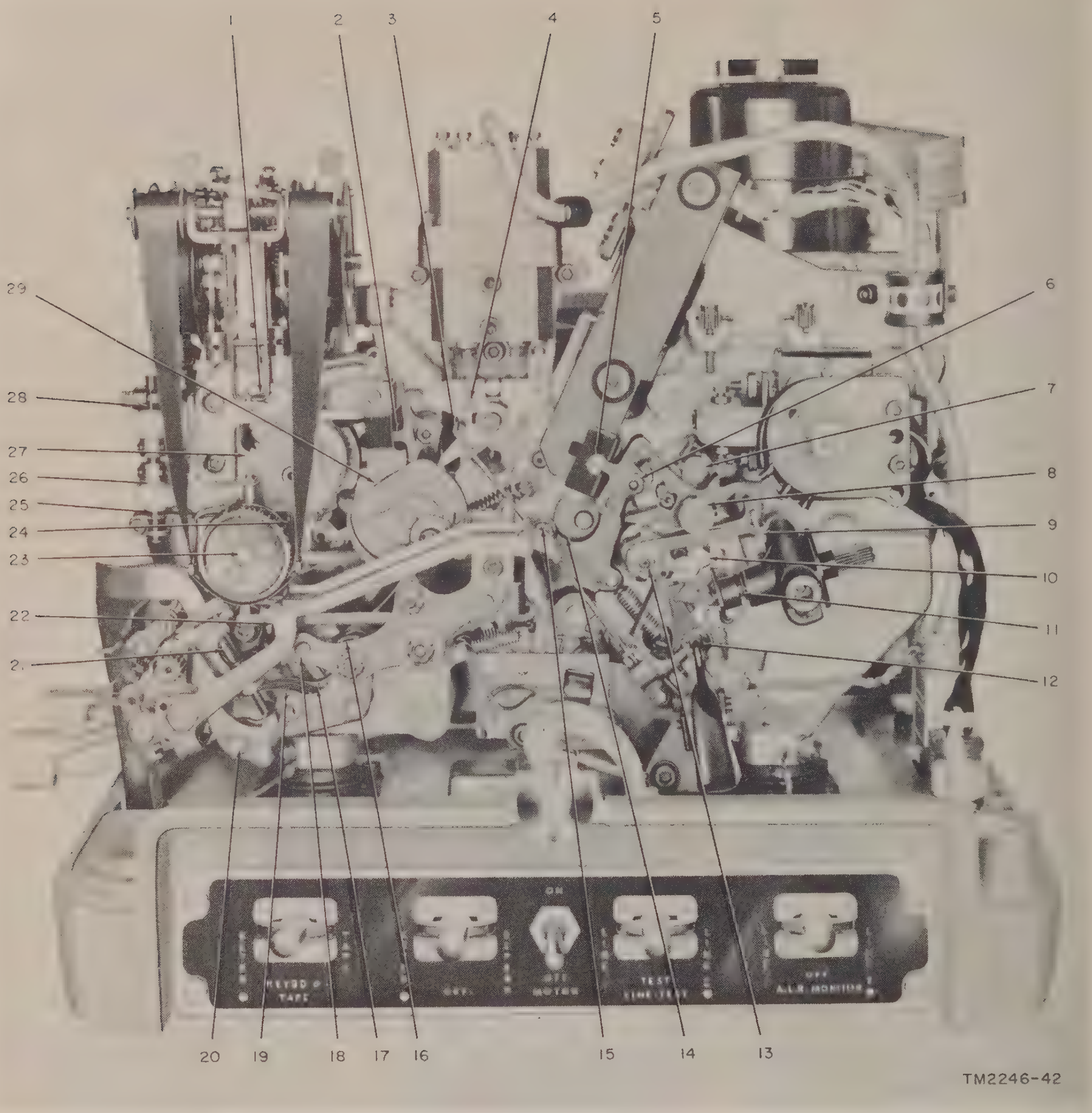
d. Moving Parts. Apply oil at the following places—Continued

Fig. No.	Item No.	Name of part	Method and quantity
190	3	Switch actuating lever	Apply sparingly at both ends of pivot.
191	1	Governor worm	2 or 3 drops in governor hub opening.
191	2	Governor adjustment lever	1 or 2 drops at each end.
191	3	Sliding drum clutch	2 drops in hole on drums.
191	5	Governor adjustment screw	Apply sparingly to entire thread.
191	6	Motor governor adjustment gear	Apply sparingly to gear teeth.
192	1, 5	Contact pivot posts	2 drops at pivot point.
192	2, 4	Function shaft pulsing cams	Slight film of oil on all bearing surfaces.
193	1	Clutch magnet armature	1 or 2 drops at pivot and working ends.
193	2	Sensing lever comb	1 or 2 drops in each comb slot.
193	3	Tape feed retracting lever	1 or 2 drops at pivot and working ends.
193	4	Code sensing levers	Apply sparingly at working surfaces and at pivot.
193	5	Stop-start lever	1 or 2 drops at pivot and working points.
193	6	Tape feed lever	1 or 2 drops at pivot and working points.
193	7	Transmitter-distributor camshaft	Thin film on all cam lobes and stop lever cam teeth.
193	8	Selector levers, bearing shoes, and flat washers.	Apply sparingly to all rubbing and bearing surfaces.
193	9	Transmitter contact bail pivot	2 or 3 drops between arm and pivot studs.
194	1	Tape-out lever	1 or 2 drops at pivot and working points.
194	2	Tape feed claw	1 or 2 drops at pivot and working points.
194	3	Start-stop lever detent	1 or 2 drops at pivot and working points.
194	4	Lower switch bail lever	1 or 2 drops at pivot and working points.
194	5	Slack-tape lever	1 or 2 drops at pivot and working points.
194	6	Upper switch bail lever	1 or 2 drops at pivot and working points.
195	1	Tape cover hinge	1 or 2 drops at pivot.
195	2	Tape cover latch	1 or 2 drops at pivot.



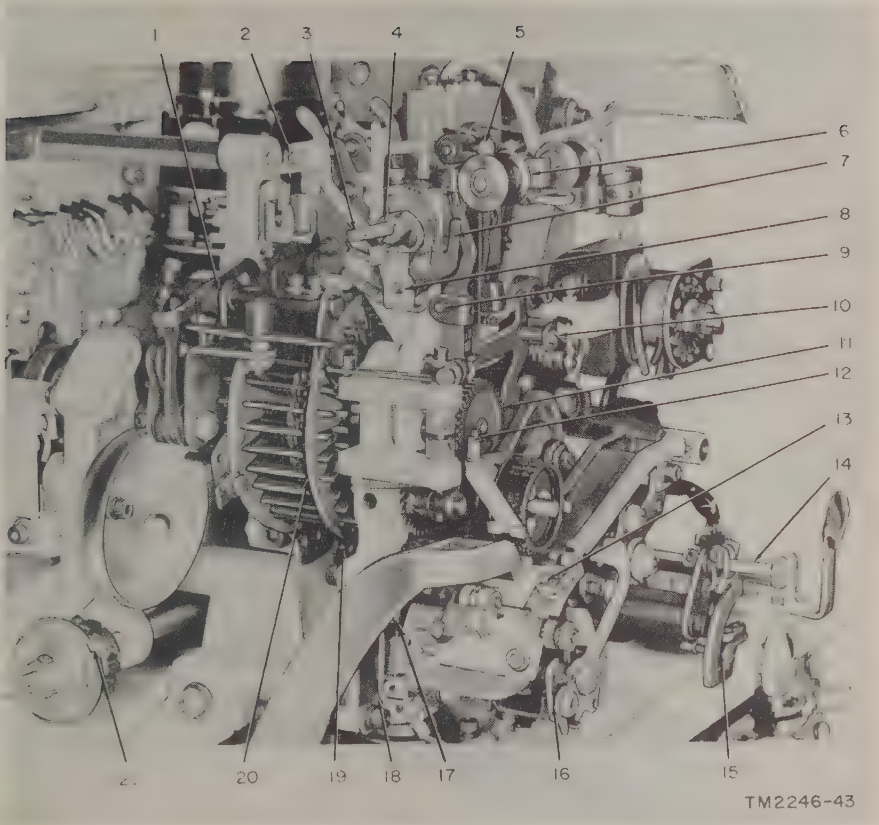
1. Ribbon retainer shaft
2. Type wheel and function lever cam
3. Code ring locking bail
4. Code ring locking bail shaft
5. Stop arm shaft antibounce clutch
6. Type wheel upper bell crank lever
7. Type wheel reciprocating transfer lever eccentric stud
8. Stop bars in code ring cage
9. Function sensing levers hub
10. Type wheel reciprocating lever assembly
11. Stop arm shaft driven gear
12. Shaft drive gear
13. Stop arm shaft friction clutch
14. Double gear
15. Clutch latch arm
16. Pulsing camshaft fork

Figure 184. Left side of perforator, showing lubrication points.



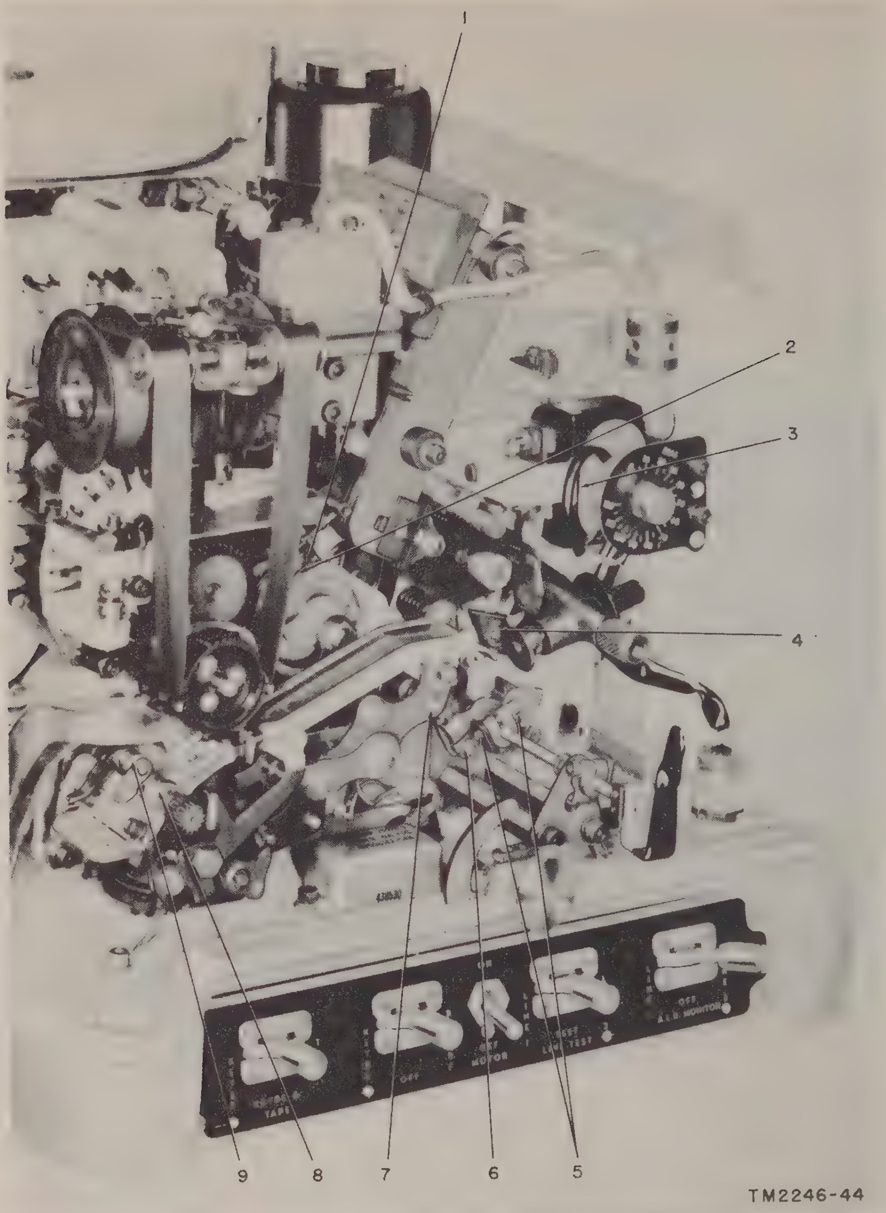
1 Driving link lever
2 Code rings and T-levers engagement
3 Manual tape feed-out link
4 Receiving multisolenoid Y-lever stud
5 Code plate and T-lever engagement
6 Y-levers and separating washers
7 Y-levers detent
8 Y-levers
9 Selector lever stop comb
10 Selector cams and stop plate
11 Rangefinder cam
12 Transfer lever trip latch shaft
13 Selector levers and separating washers
14 Transfer lever cam
15 Transfer lever roller stud
16 Punch arm pivot post
17 Code hole punch lever pivot
18 Punch interference lever shaft
19 Code hole punch lever
20 Feed pawl pivot
21 Code punch bar
22 Tape chute
23 Type wheel post
24 Type wheel hub gear
25 Type wheel lower bell crank lever
26 Reciprocating lever shaft
27 Type wheel driven gear
28 Type wheel upper bell crank lever
29 Print and register arm

Figure 185. Front view of perforator, showing lubrication points.



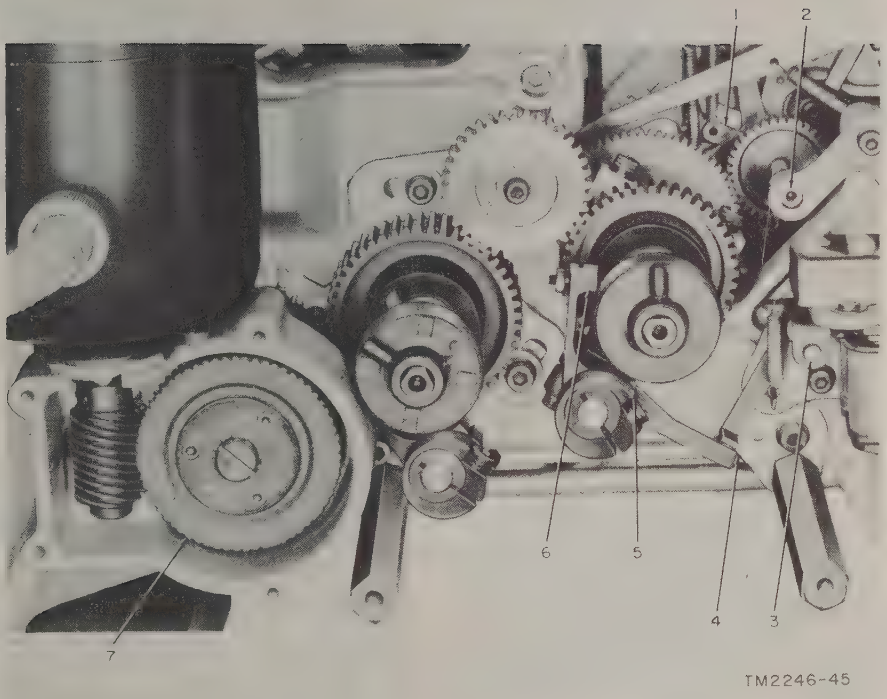
1 Code ring locking bail shaft
2 Ribbon retainer shaft
3 Ribbon spool latch
4 Ribbon spool shaft
5 Ribbon reversing toggle assembly
6 Ribbon roller shaft
7 Ratchet feed detent
8 Sensing lever shaft
9 Ribbon feed pawl shaft
10 Ribbon feed cam follower stud
11 Ribbon feed cam
12 Ribbon guide hub
13 Paper guide lever pivot
14 Manual tape feed-out shaft
15 Dust cover arm
16 Back space pawl
17 Detent lever roller
18 Detent lever stud
19 Punch interference lever
20 Code ring
21 Transmitter-distributor drive shaft friction clutch

Figure 186. Left front view of perforator, upper portion, showing lubrication points.



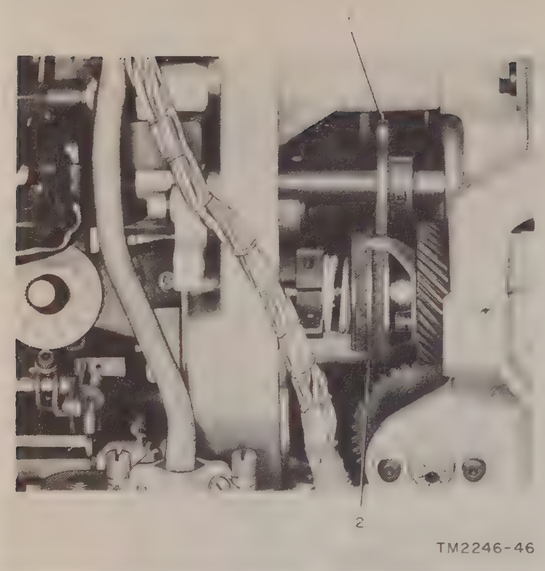
1 Type wheel register lever cam	4 Grooved pin in end of selector camshaft	7 Print and register levers shaft
2 Print hammer cam	5 Switch operating lever	8 Tape feed sprocket
3 Armature mounting shaft	6 Connecting link	9 Tape retainer assembly

Figure 187. Left front view of perforator, showing lubrication points.



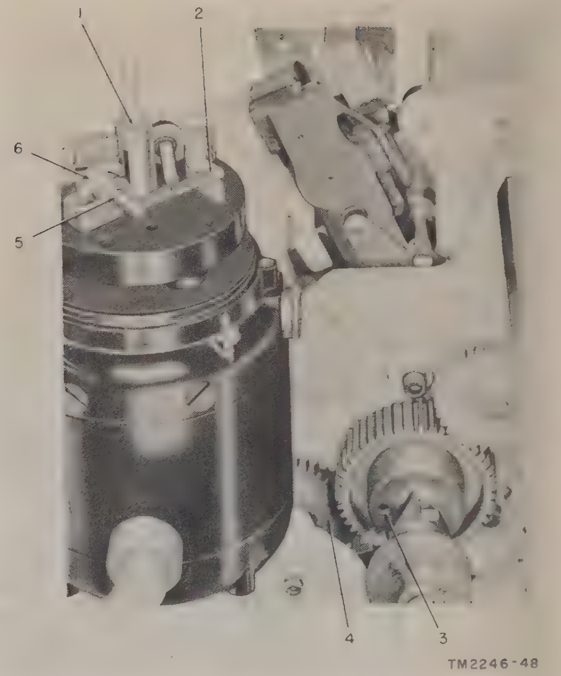
1	Reciprocating and restoring cam follower	5	Transfer lever shaft bearing
2	Stop arm shaft support plate	6	Clutch latch
3	Latch lever pivot	7	Motor driven gear set
4	Clutch release lever		

Figure 188. Rear of perforator main chassis, showing lubrication points.



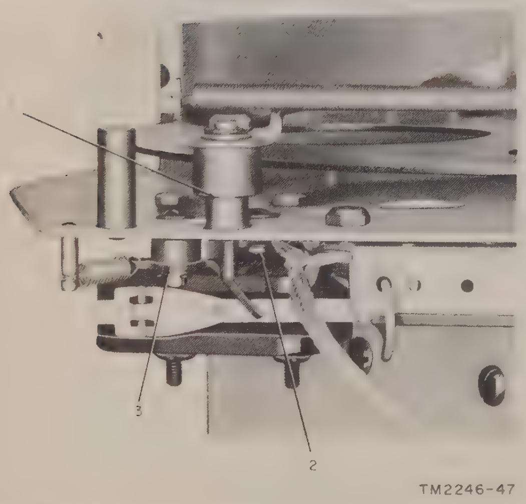
1 Code actuated switch cam
2 Selector camshaft friction clutch

Figure 189. Right side of perforator main chassis, showing lubrication points.



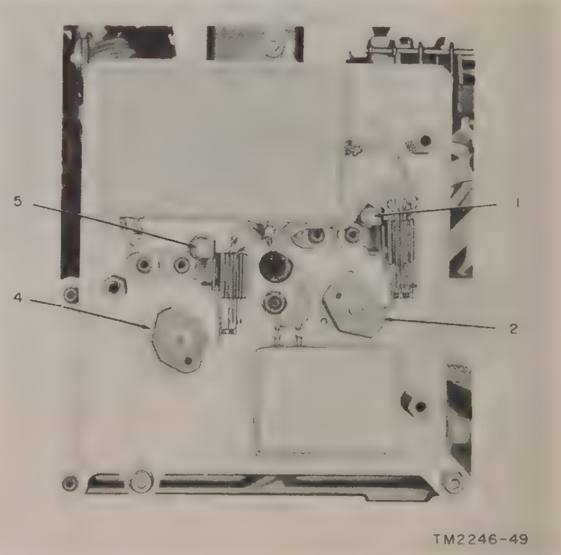
1 Governor worm
2 Governor adjustment lever
3 Sliding drum clutch
4 Power shaft gear
5 Governor adjustment screw
6 Motor governor adjustment gear

Figure 191. Governor of perforator series-governed motor and adjacent lubrication points.



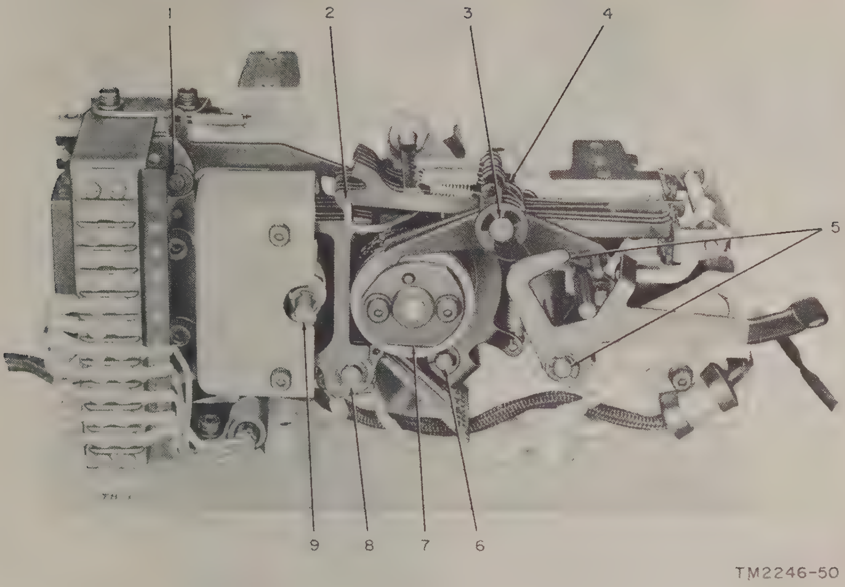
1 Alarm lever hub
2 Switch actuating arm latch pivot
3 Switch actuating lever

Figure 190. Perforator tape-out lubrication points.



1 Contact pivot post
2 Function shaft pulsing cam
4 Function shaft pulsing cam
5 Contact pivot post

Figure 192. Perforator pulsing cam assembly lubrication points.



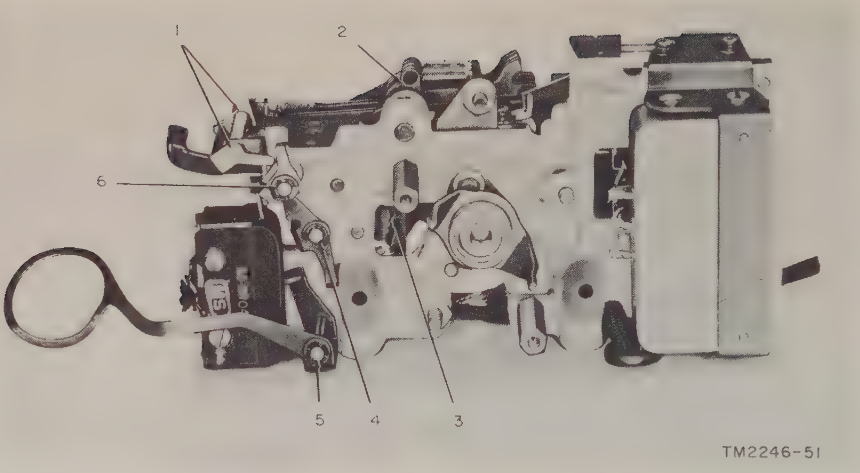
1	Clutch magnet armature
2	Sensing lever comb
3	Tape feed retracting lever
4	Code sensing lever
5	Start-stop lever
6	Tape feed lever
7	Transmitter-distributor camshaft
8	Selector levers, bearing shoes, and flat washers
9	Transmitter contact bail pivot

Figure 193. Right side view of transmitter-distributor, showing lubrication points.

144. Rustproofing and Painting

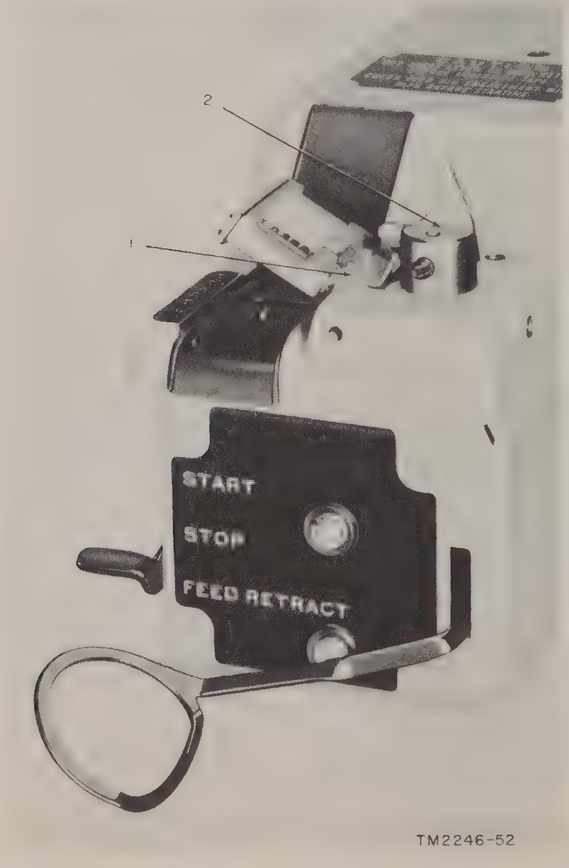
a. If the finish on painted portions of the teleprinter or dust cover is scratched or scarred, prevent rust and corrosion by painting the damaged surfaces. Use No. 00 to No. 000 sandpaper to clean the surfaces down to the bare metal. Obtain a bright, smooth finish. Do not use steel wool when working on this teleprinter as very small particles of steel wool may enter the electrical parts and cause internal shorting and grounding of circuits.

b. When touching up is necessary, apply the paint with a small brush. If numerous scars and scratches warrant complete repainting, remove the unit from service. Remove slight rust or corrosion from metal by cleaning with solvent (SD) to soften the rust, then sandpaper to complete the preparation for painting. Be sure to place protective masking, in advance, over areas where paint is not required or where paint may cause damage. Then spray paint the entire surface.



1 Tape-out lever	3 Start-stop lever detent	5 Tight-tape lever
2 Tape feed claw	4 Lower switch bail lever	6 Upper switch bail lever

Figure 194. Left side view of transmitter-distributor, showing lubrication points.



1 Tape cover hinge	2 Tape cover latch

Figure 195. Tape lid lubrication points of transmitter-distributor.

145. Sectionalizing Trouble to Major Component

a. Because Teletypewriter Set AN/FGC–25(*) has two sending and two receiving mechanisms, the first step in troubleshooting, if the trouble is not obvious, is to check one component against the other until the faulty component is isolated. For example, if the monitor copy of a message being transmitted to the signal line from the transmitter-distributor is garbled, it can be assumed that the fault lies either in the transmitter-distributor or in the page printer. By connecting the set in a local test circuit (pars. 20 and 24), and transmitting from the transmitter-distributor so that the copy will be received by both the page printer and by the perforator, it is possible to determine the malfunctioning unit. If the copy received by both receiving units is garbled, it is safe to assume that the transmitter-distributor is not functioning correctly. If good copy is received on the perforator and garbled copy is received on the page printer, it is safe to assume that the page printer is not functioning correctly. In a similar manner the trouble can be localized to any unit in the set.

b. Further sectionalization can be done on the keyboard transmitter and perforator, because both units have sequential and simultaneous circuits. If messages sent from the simultaneous circuit of the keyboard transmitter are garbled when received through the simultaneous circuit of the perforator, either the simultaneous sending or receiving unit is at fault. By adjusting the switches and sending sequential signals from the transmitter-distributor to the perforator, the trouble can be sectionalized to the malfunctioning unit since sequential signals must pass through the simultaneous circuit of the perforator before they are printed. If the message is received correctly on the perforator, it is safe to assume that the trouble is in the simultaneous circuit of the keyboard transmitter. If the message is garbled on the perforator, it is safe to assume that the simultaneous circuit of the perforator is at fault.

146. Localizing Electrical Troubles

Most electrical troubles are found at the various contacts in the unit. Electrical circuits in teleprinters have binding posts and connectors at most of the points where tests must be made. Do not disturb the wiring more than necessary when testing or inspecting.

a. *Power Supply Checks*. To be sure that proper operating conditions exist, check power supplies before making other tests.

(1) Check the line-current supply.

(2) Insert the lead of a voltmeter into the TEST VOLTS positive and negative jacks in the rear of the perforator to check the voltage output.

b. *Continuity Testing*. The continuity test is used to locate the open circuit by trying to complete the circuits through the suspected sending or receiving unit. Multimeter TS–352/U will conveniently indicate a closed circuit. In making continuity tests, be sure that parallel current paths are disconnected. Make the tests by checking the continuity through the circuit suspected to be faulty by connecting the test leads so that current can go only through the suspected circuit. Be sure no other part of the circuit is shunting the circuit being tested. If necessary, disconnect certain leads. Check all likely circuits in this manner. If, after checking all possible causes, the fault cannot be located, make a continuity test of the entire circuit. Test from one terminal to a halfway point in the circuit. If continuity is indicated, test the other half of the circuit. Continue subdividing the circuit until the open point is definitely located.

c. *Use of Local Test Circuit*. Place the machine in a local test condition. A local test circuit is most convenient for determining whether the sending and receiving circuits are defective and for making tests for operating performance.

(1) When the power is applied, current should flow and the set should run closed, indicating that the sending and receiving circuits are complete. If no current flows, one or more of the circuits is probably open. Disconnect the power and test as follows:

  (*a*) To test the continuity of the sequential transmitter mechanism (E4) circuit, remove the SEND plug (P21) and using the ohmmeter, check across the plug (P21). The ohmmeter needle should deflect to indicate continuity.

(b) To test the continuity of the transmitter-distributor send circuit remove the TAPE DIST. plug (P37) and check across P37 and J37 on the patch panel. The ohmmeter needle should deflect to indicate continuity.

(c) To test the continuity of the page printer receive circuit, remove the REPERF plug (P22) and check across the contacts of the plug. The ohmmeter needle should deflect to indicate continuity.

(d) To test the continuity of the perforator receive circuit, remove the REPERF plug (P38) and check across P38 and J38 on the patch panel. The ohmmeter needle should deflect to indicate continuity.

(2) To test for shorts within a faulty teleprinter circuit when no open circuit is indicated, send R and Y code combinations from the transmitting units. If the receiving units do not receive impulses from the transmitter, the sending circuit may be shorted internally. If the receive mechanism runs open when current flows into the test circuit, the receiving circuit may be shorted internally.

d. *Testing Capacitors.* Capacitors may cause trouble by being shorted or by leaking. To test, discharge the capacitor with an insulated shorting jumper. Then disconnect one lead and connect the capacitor to an ohmmeter. Use the highest reading scale.

(1) A good capacitor will be indicated by the ohmmeter pointer first moving up the scale rapidly, then returning more slowly to the infinity mark.

(2) A capacitor in an open circuit will give a reading of infinite ohms. A shorted capacitor will give a reading of constant value between zero and infinity, depending upon the resistance of the short.

Warning: Be extremely careful when handling charged capacitors. A severe electrical shock may be received from the capacitor or leads connected to a power supply in operation.

147. Localizing Mechanical Troubles

Although many mechanical troubles can occur in teleprinters, no difficulty should be experienced in locating the fault if the sequence of operations is checked through its various steps.

a. *Method of Checking Operating Sequences.* A convenient way of checking operating sequences is to turn off the motor switches, leaving the power supply switches closed, and then turn the motor by hand to make the mechanical components of the teleprinter work slowly. Any key on the keyboard transmitter may be depressed, or any code group can be sent from a punched tape on the transmitter-distributor and as the motor is turned slowly, each impulse may be checked at the transmitter, the selector mechanism, and on a line-current meter. Turn the motor further, observe the transfer, type selecting, printing or the operations of functions on the page printer or the transfers, both to the code actuated switch and to the code rings, print wheel placement, punching, or the operation of functions on the perforator. This allows every step of the operating cycle to be checked. This procedure will reveal troubles caused by maladjustment, broken parts, or faulty assembly.

b. *Use of the Test Circuit.* Use the test circuit when making the above slow-motion tests. The transmission of each transmitted impulse can be checked visually against the operation of the receiving mechanism. To send from the keyboard transmitter, depress the key for the signal desired and turn the page printer motor by hand. To send from the transmitter-distributor, insert a tape punched with the operation desired, move STOP-START lever to START and turn the perforator motor by hand.

148. Troubleshooting Charts

The most common failures that can occur in teleprinters, together with the probable cause of the trouble and the corrective action to be taken, are listed in the chart below. Both electrical and mechanical troubles are listed in the order of their importance. Although several probable causes are given for most troubles, all of these may not occur at the same time. Determine which cause applies to the particular situation being investigated.

a. Keyboard Transmitter Troubleshooting Chart.

Condition	Probable trouble	Correction
1. Cannot send sequential signals from keyboard transmitter.	*a.* SEND plug disconnected from rear of perforator. *b.* Transmitter contacts out of adjustment. *c.* Keyboard transmitter plug disconnected. *d.* Keyboard transmitter friction clutch out of adjustment. *e.* XMTR camshaft locked up by improper setting of keyboard control switch on the perforator. *f.* Cam stop lever binding.	*a.* Connect plug. *b.* Adjust contacts (par. 391). *c.* Connect keyboard transmitter plug. *d.* Adjust friction clutch (par. 414). *e.* Adjust switch to KEYBD or KEYBD & TAPE setting as required. *f.* Clean and adjust cam-stop lever (par. 407).
2. Transmitter camshaft rotates continuously.	*a.* Locking lever latch spring missing or broken. *b.* Universal bar adjusting screw out of adjustment. *c.* Restoring solenoid (L1) not operating. *d.* Repeat blocking lever spring broken or missing.	*a.* Replace locking lever latch spring. *b.* Adjust setting of universal bar adjusting screw (par. 398). *c.* Locate and correct circuit fault (pars. 114 and 146). Replace restoring solenoid if necessary. *d.* Replace repeat blocking lever spring.
3. Sequential transmitter mechanism transmits garbled copy.	*a.* Friction clutch dry or out of adjustment. *b.* Sequential transmitter contacts dirty or out of adjustment. *c.* Contact bail spring weak. *d.* Binding in selector levers or sensing levers. *e.* Sensing lever locking bail spring weak or missing.	*a.* Lubricate (par. 142) and adjust (par. 414). Replace felt disks if necessary. *b.* Clean and adjust transmitter contacts (par. 391). *c.* Replace contact bail spring. *d.* Clean and adjust sensing levers and selector levers (par. 390). *e.* Replace sensing lever locking bail spring.
4. Indicator carriage does not advance to the right.	*a.* Ratchet pawl spring broken or missing. *b.* Cam follower spring broken. *c.* Ratchet wheel detent spring missing.	*a.* Replace ratchet pawl spring. *b.* Replace cam follower spring. *c.* Replace ratchet wheel detent spring.
5. Indicator carriage does not return to zero when CAR. RET. key lever is depressed.	*a.* Carriage-return finger function blocking bar bent or broken. *b.* Indicator return spring broken or improperly adjusted.	*a.* Straighten finger or replace function blocking bar. *b.* Adjust or replace indicator return spring (par. 396).
6. End-of-line lamp does not light.	*a.* End-of-line lamp burned out. *b.* End-of-line switch faulty. *c.* Short or open in end-of-line switch.	*a.* Replace end-of-line lamp. *b.* Replace end-of-line switch. *c.* Replace end-of-line switch.
7. Simultaneous transmitter mechanism does not transmit.	*a.* Keyboard reader pulsing contacts S11 worn or pitted. *b.* Keyboard reader pulsing mechanism binding. *c.* Short or open in transmitter simultaneous circuit. *d.* Perforator control switch S31 in REPERF position.	*a.* Clean and burnish keyboard reader pulsing contacts (par. 133). *b.* Clean and adjust keyboard reader pulsing mechanism. *c.* Locate and correct short or open circuit (pars. 113 and 146). *d.* Place perforator control switch S31 in KEYBD position.
8. Keyboard transmitter operates properly, but causes noise on local radio receivers.	*a.* Faulty rf filter Z2. *b.* Faulty rf filter Z2 connections.	*a.* Check filter Z2; replace if defective. *b.* Check and replace defective bonding straps; tighten connections.

b. Page Printing Mechanism Troubleshooting Chart.

Condition	Probable trouble	Correction
1. Motor fails to start	*a.* POWER fuse F1 blown	*a.* Replace fuse F1 1.6 amp (fig. 12).
	b. Failure of power source.	*b.* Correct defect or use another power source.
	c. Motor stop contacts S1 dirty or do not close.	*c.* Clean and burnish motor-stop contacts S1 (par. 131).
	d. Dirty commutator on motor.	*d.* Clean commutator (pars. 131 and 172).
	e. Defective motor brushes.	*e.* Replace brushes (par. 171).
	f. Open in field or armature winding.	*f.* Replace motor.
	g. Dry friction clutches or mechanical binding.	*g.* Locate and correct trouble in mechanism.
2. Motor runs but speed is erratic.	*a.* Governor contacts dirty or pitted.	*a.* Clean, burnish, or replace contacts.
	b. Governor spring broken.	*b.* Replace spring.
	c. Motor-stop contacts weak or broken.	*c.* Install new motor-stop contacts S1.
	d. Dirty commutator on motor.	*d.* Clean commutator.
3. Page printing mechanism runs open (mechanism runs when line current should be steady marking).	*a.* Line circuit fuse F7 blown	*a.* Replace fuse F7.
	b. External line circuit open or shorted	*b.* Check line from teleprinter terminals for continuity or short.
	c. No line current or low line current	*c.* Correct or replace source of voltage. Adjust line increase resistor.
	d. Space instead of mark impulses received	*d.* Reverse line leads.
	e. Receiving circuit open or shorted	*e.* Check for continuity or short and repair fault.
	f. Sending circuit open	*f.* Check circuit continuity and repair fault.
	g. Selector-magnet armature not holding stop lever.	*g.* Readjust selector mechanism (pars. 296–324).
	h. Transfer lever latch spring broken	*h.* Replace transfer lever latch spring.
	i. Selector camshaft stop plate or stop lever worn or broken.	*i.* Replace stop plate or stop lever.
4. Page printing mechanism prints errors or scrambles letters and functions.	*a.* Rangefinder dial assembly improperly set.	*a.* Adjust rangefinder dial assembly.
	b. Sending contacts dirty or pitted	*b.* Clean, burnish or replace sending contacts.
	c. Selector camshaft or XMTR camshaft friction clutch slipping.	*c.* Adjust friction clutch (par. 329 or 414).
	d. Dirty, binding, or sticking selector mechanism.	*d.* Clean or adjust selector parts (pars. 296–324).
	e. Worn or broken Y- or T-levers	*e.* Replace defective levers.
	f. Selector camshaft stop plate loose	*f.* Replace worn parts.
	g. Selector lever spring broken	*g.* Replace selector lever spring.
	h. Square shaft friction clutch slipping	*h.* Adjust friction clutch (par. 330).
	i. Selector-magnet mounting loose	*i.* Readjust and tighten mounting screws (pars. 296–324).
	j. Type arm or function selecting arm loose	*j.* Readjust and tighten selecting arms (par. 352).
5. Page printing mechanism prints same character or performs same function regardless of signals being sent.	*a.* Transfer lever latch spring or transfer lever spring broken.	*a.* Replace a broken spring.
	b. Antibounce clutch jammed	*b.* Replace antibounce clutch.
	c. Function selecting arm sticking in punch bar guide block.	*c.* Clean and readjust if necessary.
6. Certain characters (or functions) will not print (or operate).	*a.* Stop bar sticking	*a.* Clean stop bar guide plate and code rings.
	b. Stop bar spring broken or missing	*b.* Replace spring.

b. Page Printing Mechanism Troubleshooting Chart.—Continued

Condition	Probable trouble	Correction
7. Page printing mechanism operates, but range (rangefinder measurement) is narrow.	*a.* Line current too high or too low	*a.* Readjust line current.
	b. Bias potentiometer improperly set	*b.* Check and adjust the resistance of the bias potentiometer.
	c. Motor speed incorrect at transmitter	*c.* Have transmitter motor speed checked.
	d. Selector mechanism improperly adjusted	*d.* Make complete adjustment of selector mechanism (pars. 296–324).
8. Page printing mechanism prints, but causes noise on local radio receivers.	*a.* Faulty rf filter	*a.* Check filter; replace if defective.
	b. Faulty rf filter connections	*b.* Check and replace defective bonding straps; tighten connections.
9. Page printing mechanism prints but sticks in print position.	*a.* Type bar connecting spring weak or missing.	*a.* Replace type bar connecting spring.
	b. Print mechanism binding	*b.* Clean and adjust print mechanism.
10. Platen will not shift	*a.* Figures sensing lever spring broken	*a.* Replace spring.
	b. Platen shift arm mounting loose	*b.* Readjust arm and tighten mounting screws (par. 360).
	c. Figures shift sensing lever or cam follower bent or broken.	*c.* Replace defective parts.
11. Platen will not unshift	*a.* Function aperture gate stuck	*a.* Clean function group parts.
	b. Signal bell or motor stop punch bar stuck in operated position.	*b.* Clean function group parts.
12. Platen cannot be prevented from returning to figures position or is erratic.	*a.* Cam follower stop collar on mounting stud dirty or improperly placed.	*a.* Clean and adjust collar (par. 306).
	b. Line feed and figures shift cam follower spring broken.	*b.* Replace broken line feed and figures shift clam follower spring.
13. Carriage will not feed	*a.* Carriage-feed link improperly adjusted	*a.* Readjust link (par. 365).
	b. Carriage-feed clutch slipping	*b.* Readjust clutch, replace felts if necessary (par. 372).
	c. Driving collar loose	*c.* Tighten setscrews.
	d. Carriage-feed clutch lever spring broken	*d.* Replace spring.
	e. Ribbon-driving mechanism jammed	*e.* Readjust ribbon-driving mechanism (par. 379).
14. Carriage does not feed properly.	*a.* Carriage-return link improperly adjusted.	*a.* Adjust link (par. 340).
	b. Carriage-feed pawl spring broken	*b.* Replace spring.
15. Carriage return function does not operate.	*a.* Carriage-return link improperly adjusted.	*a.* Adjust link (par. 340).
	b. Carriage-return sensing lever spring broken.	*b.* Replace spring.
	c. Carriage-return clutch mechanism out of adjustment.	*c.* Adjust carriage-return mechanism (pars. 339–347).
16. Carriage does not make complete return.	*a.* Latch-tripping arm improperly adjusted	*a.* Readjust latch-tripping arm (par. 336).
	b. Mechanism binding	*b.* Clean and adjust carriage mechanism.
17. Line feed function does not operate.	*a.* Line feed sensing lever spring broken	*a.* Replace spring.
	b. Line feed pawl spring broken	*b.* Replace spring.
	c. Line feed detent stuck	*c.* Clean detent parts.

b. Page Printing Mechanism Troubleshooting Chart.—Continued

Condition	Probable trouble	Correction
18. Line feed occurs on every operation or is erratic.	*a.* Cam follower stop collar and stud dirty or stop collar improperly placed.	*a.* Clean collar and stud and reset collar if necessary.
	b. Line feed and FIGS shift cam follower spring broken.	*b.* Replace spring.
19. Signal bell does not ring	*a.* Clapper bent	*a.* Straighten clapper.
	b. Signal bell punch bar sticks	*b.* Clean function group parts.
20. Motor stop fails to operate.	*a.* Motor-stop contacts bracket improperly adjusted.	*a.* Readjust position of bracket (par. 386).
	b. Motor-stop contacts bent or broken	*b.* Replace defective parts.
	c. Motor-stop function lever binding	*c.* Clean and lubricate pivot and bearings.
	d. Motor-stop punch bar sticks	*d.* Clean function group parts.
21. Only part of characters print.	*a.* Ribbon lifter not raising far enough	*a.* Adjust ribbon lifter (par. 374).
	b. Stop screw for platen arm not properly adjusted.	*b.* Adjust platen arm stop screw (par. 362).
22. Printing too light or too heavy.	Round nut on type selecting arm properly adjusted.	Adjust round nut (par. 374).
23. Lines are not printed straight.	*a.* Platen arm stop screw loose	*a.* Tighten stop screw.
	b. Platen casting eccentric mounting screw not properly adjusted.	*b.* Adjust platen casting eccentric mounting screws (par. 358).
24. Margins printing unevenly.	Carriage-return blocking mechanism improperly adjusted.	Adjust carriage-return blocking mechanism (par. 344).
25. Ribbon lifter not working properly.	*a.* Broken lifter tension spring	*a.* Replace spring.
	b. Dirty, bent, or broken parts	*b.* Clean and replace broken parts.
26. Ribbon does not feed or does not reverse.	*a.* Ribbon spool not seated correctly on driving collar or collar loose on shaft.	*a.* Check seating of spool and tighten collar setscrew.
	b. No spring tension on ribbon feed clutch.	*b.* Reset collar for proper spring tension (par. 380).
	c. Bevel gears not meshing	*c.* Replace weak detent spring.
	d. Ribbon reversing sensing lever, bent, dirty, or has broken spring.	*d.* Clean, adjust, and replace parts as necessary.
27. Margin bell does not ring properly.	*a.* Margin bell pawl tripping arm improperly set or pawl broken.	*a.* Reset arm or replace broken part.
	b. Pawl spring broken	*b.* Replace pawl spring.
	c. Clapper spring broken	*c.* Replace clapper spring.
	d. Clapper bent	*d.* Straighten clapper.
28. Paper tension roller cannot be released.	*a.* Pin on roller bent or broken	*a.* Replace defective pin.
	b. Paper release mechanism binding	*b.* Clean and adjust mechanism (par. 357).
29. Page printer emits grinding or whining noise.	*a.* Motor drive gears improperly meshed	*a.* Adjust position of motor.
	b. Fouled bearings in motor, main shaft, or function shaft.	*b.* Clean and lubricate or replace bearings if necessary.
	c. Motor shaft or main shaft bent	*c.* Replace bent shaft.

c. Transmitter-distributor Trouble Shooting Chart.

Condition	Probable trouble	Correction
1. Transmitter camshaft does not rotate.	*a.* Clutch magnet not energized	*a.* Check tape-out linkage (pars. 518 and 519) and switch. Check clutch magnet circuit.
	b. Armature does not clear stop lever	*b.* Check armature eccentric stud adjustment (par. 510) and magnet cores adjustment (par. 511).
	c. Friction clutch dry or out of adjustment	*c.* Lubricate and adjust (par. 520) friction clutch.
	d. STOP-START lever not in start position.	*d.* Move lever to correct position.
	e. Plug P14 disconnected from jack J14	*e.* Connect transmitter-distributor plug P14.
2. Camshaft rotates, but signals are not transmitted to signal line.	*a.* Signal circuit open or shorted	*a.* Locate open or short and correct fault.
	b. Line current not furnished by associated equipment.	*b.* Supply power to signal line.
	c. Transmitter-distributor transmitter contacts E6 dirty or out of adjustment.	*c.* Clean and adjust (par. 512) transmitter-distributor transmitter contacts E6.
	d. Contact bail spring weak or broken	*d.* Replace contact bail spring.
	e. Binding in the code sensing levers or selector levers.	*e.* Clean and readjust (par. 517) or replace damaged parts.
3. Transmitter-distributor transmits only blank code combinations.	*a.* Transmitter-distributor transmitter contacts E6 dirty or out of adjustment.	*a.* Clean and adjust transmitter-distributor transmitter contacts E6 (par. 512).
	b. Selector lever comb out of adjustment	*b.* Adjust position of selector lever comb (par. 516).
	c. Code sensing lever springs weak	*c.* Replace code sensing lever springs.
	d. Code sensing levers binding	*d.* Clean and adjust code sensing levers (par 517).
4. Transmitter camshaft rotates continuously.	*a.* Tape-out linkage out of adjustment	*a.* Adjust tape-out linkage (pars. 518 and 519).
	b. Stop lever binding	*b.* Free binding. Adjust selector lever comb (par. 509).
	c. Clutch magnet armature spring weak or broken.	*c.* Replace clutch magnet armature spring.
	d. Stop lever spring weak or broken	*d.* Replace spring.
5. Tape does not feed properly.	*a.* Feed claw broken, bent or binding	*a.* Repair or replace if necessary.
	b. Tape feed lever spring, retracting spring, or feed claw spring weak.	*b.* Replace a weak spring.
6. Transmitter-distributor operates properly, but causes noise on local radio equipment.	*a.* Faulty rf filter Z3 components	*a.* Check filter Z3; replace if defective.
	b. Faulty rf filter connections	*b.* Check and replace defective bonding straps; tighten connection.

d. Perforator Trouble Shooting Chart.

Condition	Probable trouble	Correction
1. Motor fails to start	*a.* Power input fuse F5 or F6 blown	*a.* Replace fuse F5 or F6.
	b. Failure of power source	*b.* Correct defect or use another power source.
	c. Governor contact spring loose or broken	*c.* Replace spring.
	d. Governor contacts dirty or pitted	*d.* Clean, burnish, or replace contacts.
	e. Brushes badly worn	*e.* Replace brushes.
	f. Open field or armature windings	*f.* Replace motor.
	g. Shafts or bearings binding	*g.* Locate and correct trouble in mechanism.
	h. Dirty commutator on motor	*h.* Clean commutator.
2. Motor runs but speed is erratic.	*a.* Governor contacts dirty or pitted	*a.* Clean, burnish, or replace contacts.
	b. Governor spring broken	*b.* Replace spring.
	c. Dirty commutator on motor	*c.* Clean commutator.
3. Perforator operates but causes noise on local radio receivers.	*a.* Faulty rf filter Z8	*a.* Check filter Z8; replace defective.
	b. Faulty rf filter connections	*b.* Check and replace defective bonding straps; tighten connections.
4. Code actuated switch function shaft rotates continuously.	*a.* Transfer lever latch spring broken or missing.	*a.* Replace transfer lever latch spring.
	b. Low line current	*b.* Increase line current.
	c. Space instead of mark impulse received (polar operation).	*c.* Reverse signal line connections.
	d. Selector camshaft stop lever spring broken.	*d.* Replace spring.
	e. Selector camshaft stop plate or stop lever worn.	*e.* Replace worn parts.
	f. Bias potentiometer R24 not adjusted properly.	*f.* Check and readjust potentiometer R24 if necessary.
5. Receiving multi-solenoid mechanism runs open.	*a.* Clutch latch arm out of adjustment	*a.* Adjust clutch latch arm (par. 465).
	b. Receiving multi-solenoid pulsing contacts on the rear code actuated switch function shaft do not open.	*b.* Adjust receiving multi-solenoid pulsing contacts (par. 501).
	c. Keyboard reader contacts S11 on keyboard fail to open.	*c.* Adjust keyboard reader contacts S11 (par. 405).
6. Motor operates but perforator runs closed though signals are received from signal line.	*a.* Worm gear not rotated by motor	*a.* Check for missing or broken motor shaft pin.
	b. Main shaft not rotated by worm gear	*b.* Check for missing or broken gear pin on main shaft.
	c. Maladjusted stop lever eccentric	*c.* Adjust stop lever eccentric (par. 428).
	d. Maladjusted selector magnet bracket	*d.* Adjust selector-magnet bracket (par. 429).
7. Receiving multisolenoid function shaft does not rotate.	*a.* Perforator latch coils inoperative	*a.* Check perforator latch coils; replace if faulty.
	b. Receiving multisolenoid pulsing contacts S18 on the rear code actuated switch function shaft are dirty, pitted, or out of adjustment.	*b.* Clean, burnish, adjust or replace receiving multisolenoid pulsing contacts S18 (par. 507).
	c. Keyboard reader contacts on keyboard are dirty, pitted, or out of adjustment.	*c.* Clean, burnish, adjust, or replace keyboard reader contacts.
8. Perforator prints but range (rangefinder adjustment) is narrow.	*a.* Line current too high or too low	*a.* Readjust line current.
	b. Motor speed improper	*b.* Correct motor speed.
	c. Selector mechanism improperly adjusted	*c.* Make complete readjustment of selector mechanism.
	d. Bias potentiometer improperly set	*d.* Adjust bias potentiometer.

d. Perforator Trouble Shooting Chart—Continued

Condition	Probable trouble	Correction
9. Perforator prints errors or scrambles letters and functions.	*a.* Rangefinder improperly set	*a.* Adjust rangefinder (par. 421).
	b. Transfer lever latch spring broken or missing.	*b.* Replace sping.
	c. Excessive line distortion	*c.* Check line and associated equipment.
	d. Selector camshaft friction clutch dry or slipping.	*d.* Lubricate (par. 140*c*) and adjust (par. 447) selector friction clutch.
	e. Dirty, binding, or sticking selector mechanism.	*e.* Clean and adjust selector mechanism (pars. 421–446).
	f. Receiving multisolenoid has shorted or open solenoid.	*f.* Check coils in the receiving multisolenoid and replace if necessary.
	g. Worn or broken Y-levers or T-levers	*g.* Replace defective parts.
	h. Wrong gear set in use	*h.* Install proper gear set.
	i. Selector lever spring broken	*i.* Replace selector lever spring.
	j. Selector magnet mounting loose	*j.* Readjust and tighten mounting screws (pars. 421–446).
	k. Code-ring locking lever spring broken or missing.	*k.* Replace code-ring locking lever spring.
10. Perforator continues to print the same character or perform the same function although no additional signals are received.	*a.* Lever latch spring broken or missing	*a.* Replace lever latch spring.
	b. Stop bar sticking	*b.* Clean and adjust stop bars and code-ring cage (pars. 448–452).
	c. Type wheel mechanism jammed	*c.* Correct binding and adjust mechanism (pars. 476–479).
11. Certain characters (or functions) do not print.	*a.* Stop bar sticking	*a.* Clean and adjust stop bars and code-ring cage (pars. 448–452).
	b. Stop bar spring broken	*b.* Replace stop bar spring.
12. Type wheel will not stay in figures—shift position.	*a.* Shift latch spring broken or missing	*a.* Replace spring.
	b. Figures—shift sensing lever spring broken	*b.* Replace figures spring.
13. Type wheel cannot be prevented from returning to figures shift or is erratic.	*a.* Figures stop bar broken	*a.* Replace stop bar.
	b. Figures sensing lever spring broken	*b.* Replace figures sensing lever spring.
14. Signal bell does not operate.	*a.* Clapper bent	*a.* Straighten clapper as required to sound bell.
	b. Broken or loose bell sensing lever spring	*b.* Replace bell sensing lever spring.
15. Perforator prints part of characters only.	*a.* Type wheel not properly adjusted on type wheel hub assembly.	*a.* Adjust type wheel setting (par. 470).
	b. Ribbon feed not operating properly	*b.* Check ribbon feed mechanism.
	c. Register wheel not aligned with type wheel.	*c.* Check alignment.
16. Printing too light	*a.* Print hammer not properly adjusted	*a.* Adjust print hammer (par. 482).
	b. Worn inking ribbon	*b.* Replace inking ribbon.
17. Inking ribbon does not feed or ribbon feed does not reverse.	*a.* Ribbon spools not correctly set	*a.* Check seating of spools.
	b. Reversing toggle spring missing or broken.	*b.* Replace spring.
	c. Ribbon sensing lever bent, dirty, or broken.	*c.* Clean, straighten, or replace lever.
18. Perforator operates, but emits grinding or whining noise.	*a.* Fouled bearings in motor, main shaft, or function shaft.	*a.* Replace bearings if necessary.
	b. Motor shaft or main shaft bent.	*b.* Replace defective shaft.

d. Perforator Trouble Shooting Chart—Continued

Condition	Probable trouble	Correction
19. Tape perforations improperly spaced.	*a.* Feed sprocket detent not adjusted *b.* Tape binding in guide	*a.* Adjust detent (par. 489). *b.* Free tape.
20. Manual tape feed-out does not operate.	*a.* Loose lever or linkage *b.* Defective switch or circuit	*a.* Adjust mechanism (pars. 500–503). *b.* Check circuit for continuity. Replace switch if required.
21. Tape does not feed properly.	*a.* Feed pawl adjusting screw out of adjustment. *b.* Tape binding in guide	*a.* Adjust screw (par. 490). *b.* Free tape.

Section V. REMOVAL AND REPLACEMENT OF PAGE PRINTER COMPONENTS

149. General

a. This section describes replacement procedures required to overhaul completely a defective or inoperative Teletypewriter TT–117/FG or TT–119/FG. Procedure includes replacement of all parts of the unit except those parts for which the procedure is obviously simple.

b. Except in extreme emergency, all repairs should be made by personnel thoroughly trained in teleprinter maintenance. Equipment operating with minor faults may fail completely as the result of efforts by inexperienced personnel to correct apparently simple defects.

c. Follow the inspection, cleaning, and lubrication instructions given in sections II and III of this chapter. Whenever repairs are made, the page printer should be completely readjusted in accordance with section VII of this chapter.

150. General Disassembly Procedure

a. Preparation for Disassembly. Take the following preparatory steps before starting to disassemble the page printer.

(1) Arrange a clean place on a bench or table to work. Make certain that dust or dirt will not fall or be blown into the mechanism while it is being disassembled.

(2) Obtain several small, clean cardboard, wood, or metal containers to store removed parts.

(3) Arrange the necessary tools and materials so that they will be readily accessible during the progress of the repair work.

b. Disassembly Procedure.

(1) Disconnect the power and signal line connections from the page printer.

(2) Remove the dust cover.

(3) Remove the inking ribbon and paper from the page printer.

(4) Proceed to disassemble the various parts and assemblies; use the correct tool for each specific operation. Do not disassemble the page printer or its assemblies beyond the point necessary to thoroughly inspect and clean the mechanism, and to repair and replace any parts.

(5) When small parts are disassembled, it is good practice to place them in a container and mark them to identify their origin. Vary the sequence of disassembly to meet any particular situation. Use the procedure that will require the least amount of time without sacrificing quality.

151. General Reassembly Procedures

All parts, subassemblies, and units should be reassembled in accordance with the following provisions.

a. Replace all worn or broken parts that cause malfunctioning of the page printer and adjust them in accordance to the directions in the appropriate paragraph in section VII of this chapter. While the equipment is disassembled for checking and repair, replace any parts that are likely to cause trouble before the next scheduled overhaul of the machine.

b. Assemble replaced parts and associated parts together firmly. Tighten all screws, nuts, and bolts carefully, but not excessively. Many of the threaded holes are tapped into aluminum or magnesium alloy castings. These can be stripped by the use of too much force. When installing screws in aluminum or magnesium alloy castings, it is important that they are treated with Antiseize Compound, Stock No. CE–52–2724.5000.080 before installation. This will prevent binding which frequently occurs when steel screws are tightened into aluminum or magnesium castings.

c. Be careful to replace the correct springs in the friction clutches. Although the springs are similar in appearance, they are not identical. Improper assembly could result in faulty operation of the clutches and could cause premature failure of the clutches.

d. Be sure to install tapered pins so that the taper of the hole in the shaft and the hole in the part being pinned is matched and that the tapered pin is inserted in the proper direction. Before driving the pins, place a support under the parts to prevent bending or distortion.

e. When installing parts on shafts by means of setscrews, remove the setscrews from the part being installed. Sight down the tapped hole in the part to make sure the hole is in line with the flat on the shaft. Many parts are secured to the shaft by means of two setscrews. In such cases, be sure *both* tapped holes are alined with flats on the shaft.

f. Some bent and distorted parts may be restored to shape and reused, provided no cracks result from the straightening process and that the hardened surfaces have not been softened by the repairs.

g. If the locking edges of lockwashers are rounded, install new ones.

h. Replace screws or nuts that have damaged heads or threads.

152. Removal and Replacement of Page Printer Chassis

Preventive and corrective maintenance of the page printer is most easily done when the page printer is removed from the base. To remove and replace the page printer, follow the steps described in *a* and *b* below.

a. Removal.

(1) Remove the selector magnet and keyboard transmitter plugs from the receptacle connectors at the left of the printer base. Be sure to turn the locking shields on the plugs fully counterclockwise when removing the plugs. *Failure to do so may result in damage to the devices that hold the plugs in position.*

(2) Remove the motor-stop plug from the receptacle connector at the right rear of the printer base.

(3) Tilt the left side of the printer base upward and disconnect the cannon-type plug connector from the receptacle connector in the printer base.

(4) Remove the four socket head screws, lockwashers, and plain washers that hold the feet of the frame to the vibration mounts on the printer base. Lift the ends of the four grounding leads free of the mounting screws.

(5) Remove the page printer chassis from the base by lifting upward and forward.

b. Replacement.

(1) Position the page printer chassis on the four vibration mounts on the printer base.

(2) Install the four lockwashers, ground leads, and plain washers on the four socket head screws; install the four screws to hold the printer chassis to the vibration mounts.

(3) Tilt the left side of the printer base upward and connect the cannon-type plug connector to the receptacle connector in the printer base.

(4) Connect the motor stop plug to the receptacle connector at the right rear of the printer base.

(5) Connect the keyboard transmitter and selector-magnet plugs to the receptacle connectors at the left of the printer base.

153. Removal and Replacement of Keyboard Transmitter

a. Removal.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the two socket head screws and lockwashers that hold the keyboard frame to the page printer frame; remove the keyboard transmitter assembly.

b. Replacement.

(1) Position the keyboard transmitter on the page printer frame. Engage the keyboard transmitter clutch yoke with the transmitter friction clutch driver plate and secure the keyboard frame to the page printer frame with two socket head screws and lockwashers.

(2) Replace the page printer on the printer base as instructed in paragraph 152*a*

154. Removal and Replacement of Tabulator and Indicator Assembly

a. Removal.

(1) Remove the two socket head machine screws (1, fig. 196), flat washers (2), and lockwashers (3) that hold the indicator cover (4) to the indicator frame (47); remove the indicator cover.

(2) Remove the two socket head machine screws (5), flat washers (6), and lockwashers (7) that hold the indicator frame to the standoffs on the keyboard frame.

(3) Remove the two machine screws (39, fig. 202), lockwashers (40) and universal bar bracket (56) that hold the lower portion of the indicator frame (47, fig. 196) to the code bar guide studs of the keyboard frame.

(4) Remove the tabulator and indicator assembly by carefully lifting and rotating it forward slightly to clear the blocking bar.

b. Replacement.

(1) Position the tabulator and indicator assembly on the keyboard frame so that the extensions on the blocking bars engage the ratchet wheel and ratchet pawl.

(2) Install the two machine screws (39, fig. 202), lockwasher (40), and universal bar bracket (56) that hold the lower portion of the indicator frame (47, fig. 196) to the code bar guide studs on the keyboard.

(3) Install the two socket head machine screws (5), lockwashers (7), and flat washers (6) to the standoffs on the keyboard frame.

(4) Position the indicator cover (4) on the indicator frame (47); secure with two socket head machine screws (1), lockwashers (3), and flat washers (2).

155. Disassembly and Reassembly of Indicator Drive Shaft Assembly

a. Disassembly.

(1) Remove the retainer ring (1, fig. 197) and the flat washer (2) from the end of the line indicator drive shaft (23).

(2) Remove the retainer ring (3) from the bearing (4); remove the bearing from the indicator frame (47, fig. 196).

(3) Remove the retainer ring (5, fig. 197) from the bushing in the indicator return spring housing (8); remove the retainer ring (6) from the line indicator drive shaft (23); slide the line indicator drive shaft to the right and remove the line indicator drive shaft assembly from the tabulator and indicator frame assembly.

(4) Loosen the setscrew (7) in ratchet wheel (12); slide the line indicator drive shaft (23) to remove the indicator return spring housing (8) and the end of the line indicator drive shaft (23) from the frame.

(5) Unhook the indicator return spring housing (8) from the indicator return spring (9); remove the indicator return spring housing (8) from the line indicator drive shaft (23).

(6) Remove the indicator return spring (9) from the pin (10) in the line indicator drive shaft (23); drive the pin from the drive shaft. Remove the spring retainer (11) from the shaft. Remove the ratchet wheel (12) from the line indicator drive shaft (23).

(7) Remove the guide roller (13) from the tabulator drive pin stud (19); remove the tabulator drive pin stud (19) and the lockwasher (20) from the indicator carriage (22).

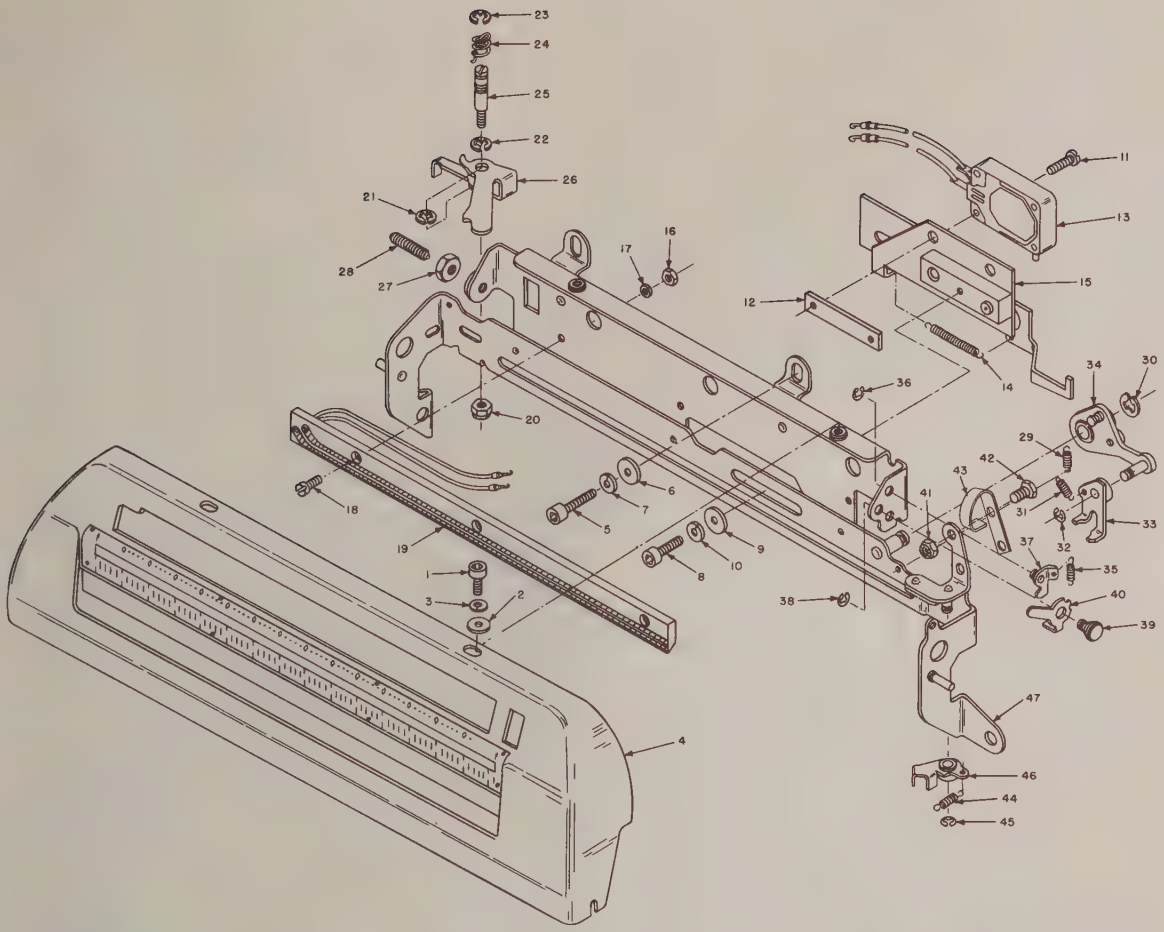
(8) Remove the retainer ring (14) from the top of the tab contact mounting pivot (17); remove the tab stop contact (15). Unhook the tab stop contact spring (16) from the tab stop contact (15) and from the space indicator (21); remove the spring from the contact (15).

(9) Remove the tab contact mounting pivot (17) and the lockwasher (18) from the indicator carriage (22). Remove the space indicator (21) from the indicator carriage (22).

(10) Remove the indicator carriage (22) from the line indicator drive shaft (23).

b. Reassembly.

(1) Install the indicator carriage (22) on the line indicator drive shaft (23) with the tabulator contact mounting pivot hole up, and the tabulator drive pin stud hole facing the frame.

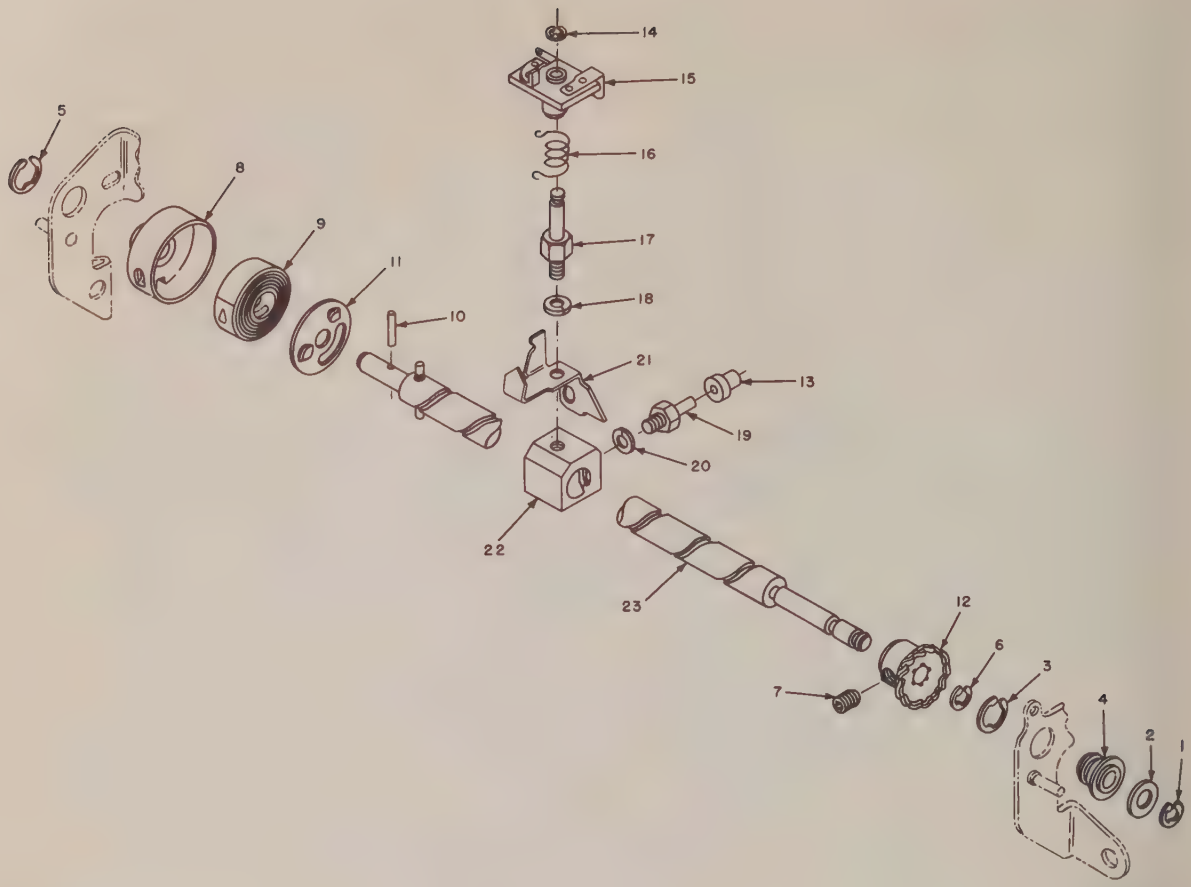


1	Machine screw, 10393	17	Lockwasher, 10433	33	Ratchet pawl, 55897A
2	Flat washer, 10959	18	Screw, 10347	34	Cam follower, 55955A
3	Lockwasher, 10429	✓19	Tab stop contact, 55951A	35	Detent spring, 55942
4	Indicator cover, 55945	20	Self-locking hexagonal nut, 10500	✓36	Retainer ring, 10969
5	Machine screw, 10004	✓21	Retainer ring, 10960	37	Detent, 55930A
6	Flat washer, 10450	✓22	Retainer ring, 10960	38	Retainer ring, 10969
7	Lockwasher, 10429	✓23	Retainer ring, 10960	39	Locking lever stud, 55926
8	Machine screw, 10003	24	Tab actuator arm spring, 55974	40	Tabulator locking lever, 55927
9	Flat washer, 10450	✓25	Tab actuator arm stud, 55973	41	Self-locking hexagonal nut, 10551
10	Lockwasher, 10429	✓26	Tab actuator arm, 55972	42	Machine screw, 10086
11	Machine screw, 10105	27	Plain hexagonal nut, 10507	43	Spring, 55971
12	Nut plate, 55829	28	Setscrew, 10229	✓44	Ratchet wheel detent spring, 53313
✓13	End-of-line switch, 20128	29	Cam follower spring, 55959	✓45	Retainer ring, 10969
14	Switch actuator spring, 55877	✓30	Retainer ring, 10949	✓46	Ratchet wheel detent, 53240A
15	Switch actuator mechanism, 55994	31	Ratchet pawl spring, 55958	47	Indicator frame, 55920A
16	Nut, 10536	32	Retainer ring, 10969		

Figure 196. Indicator frame assembly, exploded view.

(2) Position the space indicator (21) on the indicator carriage (22) and attach the space indicator (21) to the indicator carriage (22) with the lockwasher (18) and the tab contact mounting pivot (17).

(3) Install the tab stop contact spring (16) on the tab stop contact (15); hook the upper end of the spring (16) on the ratchet tab on the contact (15). Install the tab stop contact (15) and the tab stop contact spring (16) on the tab contact mounting pivot (17); hook the lower end of the spring (16) on the space indicator (21). Install the retainer ring (14) on the end of the tab contact mounting pivot (17).



TM 2246-253

✓1 Retainer ring, 10949
✓2 Flat washer, 55848
3 Retainer ring, 10998
✓4 Bearing, 53226
✓5 Retainer ring, 10998
✓6 Retainer ring, 10949
7 Setscrew, 10201
8 Indicator return spring housing, 54640A (includes item 9)
9 Indicator return spring
10 Pin, 10988
11 Spring retainer, 53252
✓12 Ratchet wheel, 53230A
✓13 Guide roller, 53246
✓14 Retainer ring, 10969
15 Tab stop contact S13
✓16 Tab stop contact spring, 55469
17 Tab contact mounting pivot, 55967
✓18 Lockwasher, 10429
✓19 Tabulator drive pin stud, 55968
✓20 Lockwasher, 10429
✓21 Space indicator, 55970
22 Indicator carriage, 55966
23 Line indicator drive shaft, 53220A (includes items 10 and 11)

Figure 197. Line indicator drive shaft assembly, exploded view.

(4) Place the lockwasher (20) on the tabulator drive pin stud (19); install the tabulator drive pin stud (19) in the indicator carriage (22). Place the guide roller (13) on the tabulator drive pin stud (19).

(5) Slide the ratchet wheel (12) and the spring retainer (11) on the line indicator drive shaft (23). Drive the pin (10) in the line indicator drive shaft (23). Attach the inside end of the indicator return spring (9) to the pin (10).

(6) Position the indicator return spring housing (8) on the line indicator drive shaft (23) and on the indicator return spring (9); hook the outer end of the indicator return spring (9) to the tab in the indicator return spring housing (8).

(7) Install the assembled line indicator drive shaft (23) in the indicator frame; insert the ratchet wheel end of the line indicator drive shaft through the hole in the indicator frame first and then insert the

bushing of the indicator return spring housing (8) in the hole at the other end of the indicator frame.

(8) Install the retainer ring (5) in the bushing on the indicator return spring housing (8). Install the retainer ring (6) on the line indicator drive shaft (23).

(9) Insert the bearing (4) in the indicator frame and secure it to the indicator frame with the retainer ring (3).

(10) Place the flat washer (2) over the end of the line indicator drive shaft (23); install the retainer ring (1).

(11) Adjust the line indicator drive shaft assembly as instructed in paragraphs 395, 396, and 399.

156. Disassembly and Reassembly of Indicator Frame Assembly

a. Disassembly.

(1) Remove the machine screw (8, fig. 196), flat washer (9), and lockwasher (10) that attach the switch actuator mechanism (15) to the indicator frame (47); remove the switch actuator mechanism from the indicator frame.

(2) Remove the two machine screws (11) that attach the end of line (13) to the switch actuator mechanism (15); remove the end of line switch (13) and the nut plate (12).

(3) Unhook the end of the switch actuator spring (14) from the hole in the switch actuator mechanism (15), and the other end from the hole in the actuator arm; remove the spring.

(4) Remove the three nuts (16) and lockwashers (17) from the screws (18) in the tab stop contact (19); disconnect the plugs at the ends of the wires, and remove the tab stop contact (19) from the indicator frame (47).

(5) Hold the tab actuator arm stud (25) securely and remove the self-locking hexagonal nut (20) that attaches the stud (25) to the tab on the indicator frame (47); remove the stud assembly from the indicator frame (47).

(6) Remove the retainer rings (21, 22, and 23); remove the tab actuator arm spring (24) and the tab actuator arm (26) from the tab actuator arm stud (25).

(7) Remove the plain hexagonal nut (27) and the setscrew (28) that hold the tabulator mechanism to the indicator frame (47); remove the tabulator mechanism.

(8) Remove one end of the cam follower spring (29) from the spring post on the cam follower (34), and the other end from the hole in the indicator frame (47); remove the cam follower spring (29).

(9) Remove the retainer ring (30) from the mounting stud on the indicator frame (47).

(10) Remove one end of the ratchet pawl spring (31) from the spring post on the cam follower (34), and the other end from the hole in the ratchet pawl (33); remove the spring (31).

(11) Remove the retainer ring (32) from the mounting stud on the cam follower (34); remove the ratchet pawl (33).

(12) Remove the cam follower (34) from the mounting stud on the indicator frame (47).

(13) Remove the end of the detent spring (35) from the detent (37), and the other end from the notch in the indicator frame (47); remove the detent spring (35).

(14) Remove the retainer ring (36) from the mounting stud on the detent (37); remove the detent (37) from the indicator frame (47).

(15) Remove the retainer ring (38) from the locking lever stud (39); remove the locking lever stud (39) and the tabulator locking lever (40) from the indicator frame (47).

(16) Remove the self-locking hexagonal nuts (41) from the machine screws (42); remove the spring (43) from the indicator frame (47).

(17) Remove one end of the ratchet wheel detent spring (44) from the hole in the ratchet wheel detent (46) and the other end from the hole in the indicator frame (47); remove the ratchet detent spring (44).

(18) Remove the retainer ring (45) from the mounting stud on the frame (47); remove the ratchet wheel detent (46) from the indicator frame (47).

b. Reassembly.

(1) Position the ratchet wheel detent (46) on the mounting stud on the indicator frame (47); install the retainer ring (45) on the end of the mounting stud.

(2) Hook one end of the ratchet wheel detent spring (44) in the hole in the ratchet wheel detent (46) and the other end in the hole in the indicator frame (47).

(3) Position the spring (43) on the indicator frame (47); attach the feed pawl stop lever (43) to the indicator frame (47) with two studs (42) and two self-locking hexagonal nuts (41).

(4) Position the tabulator locking lever (40) to the indicator frame (47); attach the tabulator locking lever (40) to the indicator frame (47) with the locking lever stud (39) and the retainer ring (38).

(5) Insert the mounting stud on the detent (37) in the indicator frame (47) and position the detent (37) on the indicator frame; attach the detent (37) to the frame with the retainer ring (36).

(6) Hook one end of the detent spring (35) in the hole in the detent (37) and the other end in the notch in the indicator frame (47).

(7) Position the cam follower (34) on the mounting stud on the indicator frame (47).

(8) Position the ratchet pawl (33) on the mounting stud on the cam follower (34); attach the ratchet pawl (33) to the cam follower (34) with the retainer ring (32).

(9) Hook one end of the ratchet pawl spring (31) in the hole in the ratchet pawl (33) and the other end of the spring on the spring post on the cam follower (34).

(10) Install the retainer ring (30) on the mounting stud on the indicator frame (47), holding the cam follower (34) in place.

(11) Hook one end of the cam follower spring (29) in the hole in the indicator frame (47) and the other end on the spring post on the cam follower (34).

(12) Position the tabulator mechanism on the indicator frame assembly; secure with the setscrew (28) and plain hexagonal nut (27).

(13) Install the tab actuator arm (26) on the tab actuator arm stud (25) and install the retainer rings (21 and 22) to hold the arm (26) in position on the tab actuator arm stud (25). Hook one end of the tab actuator arm spring (24) in the slot in the tab actuator stud (25) and the other end in the notch in the arm (26). Install the retainer ring (23) to hold the end of the spring (24) on the tab actuator arm stud (25).

(14) Install the stud assembly in the hole in the tab on the indicator frame (47); position the tab actuator arm stud (25) with a screw driver and hold in position while attaching it to the indicator frame (47) with the self-locking hexagonal nut (20).

(15) Position the tab stop contact (19) on the indicator frame (47); attach the tab stop contact (19) to the indicator frame with three machine screws (18), lockwashers (17), and nuts (16).

(16) Hook one end of the switch actuator spring (14) in the hole in the switch actuator mechanism (15) and the other end in the hole in the arm.

(17) Position the nut plate (12) in back and the end-of-line switch (13) in front of the switch actuator mechanism (15); attach the end-of-line switch (13) to the switch actuator mechanism (15) with two machine screws (11).

(18) Position the switch actuator mechanism (15) on the indicator frame (47); attach the switch actuator mechanism to the indicator frame with lockwasher (10), flat washer (9), and machine screw (5).

(19) Adjust the indicator frame assembly as instructed in paragraphs 399, 400, 401, 402, 408, and 409.

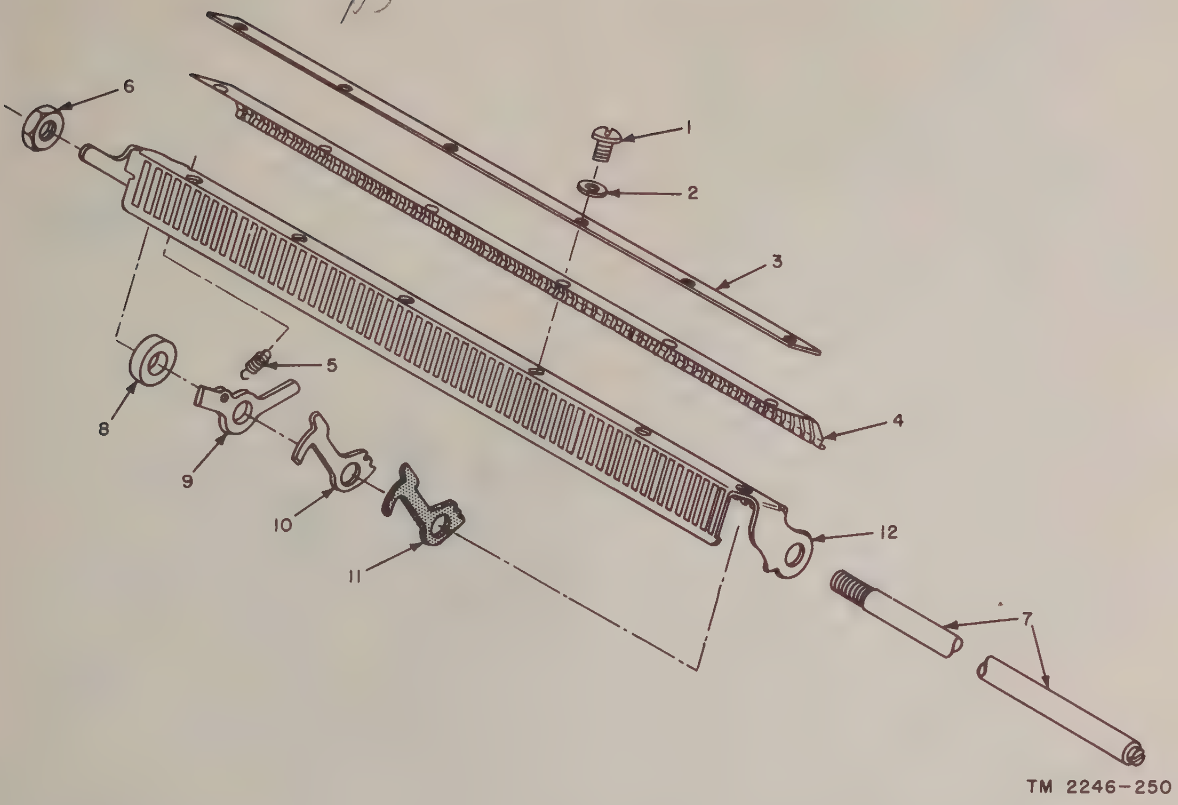
157. Disassembly and Reassembly of Tabulator Mechanism

a. Disassembly.

(1) Remove the tabulator mechanism from the indicator frame assembly as described in paragraph 156*a* (7).

(2) Remove the six machine screws (1, fig. 198) and lockwashers (2) that hold the tab rack mounting plate (3) and the detent spring plate (4) to the tab mounting guide (12); remove the tab rack mounting plate (3) and the detent spring (4) from the tab mounting guide (12).

(3) Unhook one end of the tab crank arm spring (5) from the hole in the tab rack mounting plate (3) and the other end from the hole in the tab crank arm (9); remove the spring (5).



1 Machine screw, 10374
2 Lockwasher, 10432
3 Tab rack mounting plate, 55938
4 Detent spring plate, 55939
5 Tab crank arm spring, 55941
6 Plain hexagonal nut, 10507
7 Tab lever shaft, 55928
8 Flat washer, 55929
9 Tab crank arm, 55937
10 White tab set lever, 55933
11 Red tab set lever, 55934
12 Tab mounting guide, 55935A

Figure 198. Tabulator mechanism, exploded view.

(4) Hold the tab lever shaft (7) from turning; remove the plain hexagonal nut (6) from the shaft (7).

(5) Hold the assembly over a clean container; work the tab lever shaft (7) out of the crank arm (9), the flat washers (8), the white tab set levers (10), and the red tab set levers (11). Remove the tab lever shaft (7) from the tab mounting guide (12).

b. Reassembly.

(1) Insert the threaded end of the tab lever shaft (7) in the end of the tab mounting guide (12) part of the way.

(2) The white tab set levers (10) and the red tab set levers (11) are positioned on the tab lever shaft (7) so that every fifth tab set lever is a red lever (11) which corresponds to a number that is a multiple of five on the space indicator scale. Assemble the white levers (10) and the red levers (11) in the proper sequence on the shaft (7). Assemble the tab crank arm (9) and the flat washer (8) on the threaded end of the tab lever shaft (7).

(3) Hold the tab lever shaft (7); install the plain hexagonal nut (6) on the end of the shaft.

(4) Hook one end of the tab crank arm spring (5) in the hold in the tab rack mounting plate (3) and the other end in the hole in the tab crank arm (9).

(5) Position the detent spring plate (4) and the tab rack mounting plate (3) on the tab mounting guide (12); hold the parts in position and attach them with the six lockwashers (2) and machine screws (1).

(6) Install the tabulator mechanism on the tabulator and indicator frame assembly as described in paragraph 156*b*(12).

(7) Adjust the tabulator mechanism as explained in paragraphs 408 and 409.

158. Disassembly and Reassembly of Sequential XMTR Contacts

a. Disassembly.

(1) Remove the tabulator and indicator assembly as instructed in paragraph 154*a*.

(2) Remove the two machine screws (1, fig. 199) and internal tooth lockwashers (2) that attach the contact cover (3) to the keyboard frame; remove the cover (3).

(3) Remove the two machine screws (4) and two lockwashers (5) that attach the contact mounting (15) to the keyboard frame.

(4) Unhook the end of the contact bail spring (6) from the spring post on the contact mounting (15) and the other end from the hole in the XMTR contact (9).

(5) Remove the machine screw (7), internal tooth lockwasher (8), and the two electrical terminal lugs from the side of the contact mounting (15).

(6) Remove the two machine screws (10) and two internal tooth lockwashers (11) that attach the two XMTR contact terminals (12) to the contact mounting (15).

(7) Unsolder the two spiraled electrical wires from the top of the XMTR contacts (13); remove the spiraled electrical wire and transmitter contact terminal assemblies from the contact mounting (15).

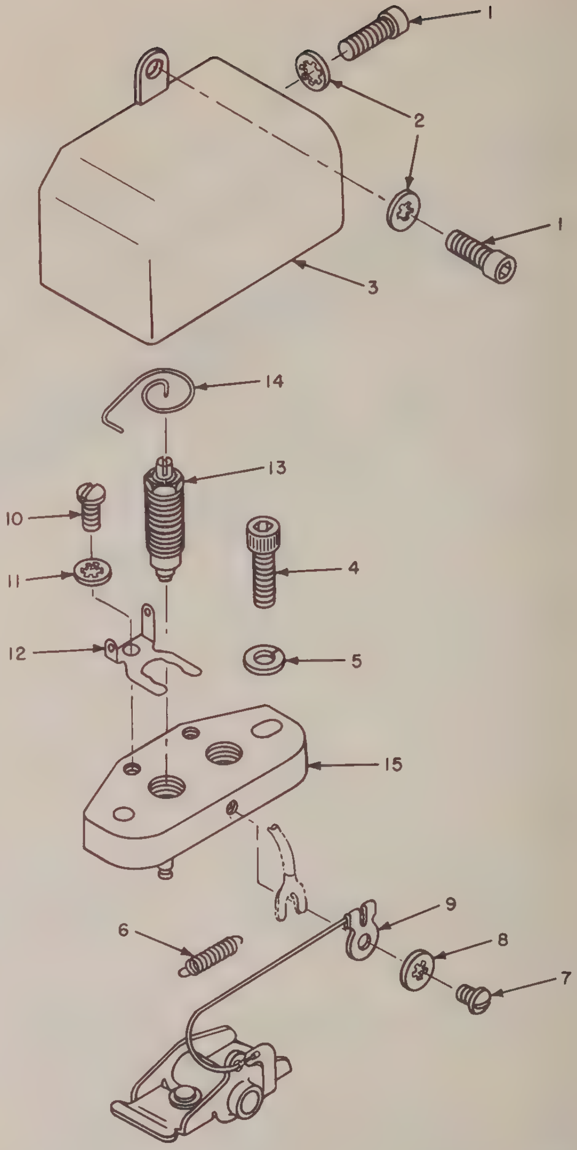
(8) Remove the two XMTR contacts (13) from the contact mounting (15).

b. Reassembly.

(1) Install the two XMTR contacts (13) in the contact mounting (15) at approximately the correct contact spacing.

(2) Position the two XMTR contact terminals (12) and the spiraled electrical wires; solder the ends of the spiraled electrical wires in the slots in the top of the contact plungers.

(3) Insert the XMTR contact terminals (12) in the threads of the XMTR contacts (13), one-half to one and one-half threads above the contact mounting (15); position the two internal tooth lockwashers (11) and hold the XMTR contact terminals (12) in place with the two machine screws (10), but do not tighten.



1	Machine screw, 10001
2	Lockwasher, 10403
3	Contact cover
4	Machine screw, 10009
5	Lockwasher, 10430
6	Contact ball spring
7	Machine screw, 10301
8	Internal tooth Lockwasher, 10403
9	XMTR contact E4
10	Machine screw, 10301
11	Internal tooth lockwasher, 10403
12	XMTR contact terminal, 51597
13	XMTR contact, 51588A
14	Electrical wire, 51610
15	Contact mounting, 51595A

Figure 199. Sequential XMTR contacts, exploded view.

(4) Position the two electrical terminals lugs on the side of the contact mounting (15):

hold the terminals lugs on the side of the contact mounting (15) with the internal tooth lockwasher (8) and the machine screw (7).

(5) Hook one end of the contact bail spring (6) in the hole in the XMTR contact (9) and the other end on the spring post on the contact mounting (15).

(6) Position the contact mounting (15) on the frame of the machine so that the contacts are in correct alinement; attach the contact mounting (15) with two lockwashers (5) and two machine screws (4).

(7) Position the contact cover (3) over the contact mounting (15); secure the cover to the frame with two internal tooth lockwashers (2) and machine screws (1).

(8) Install the tabulator and indicator assembly as instructed in paragraph 154*b*.

159. Disassembly and Reassembly of Keyboard Transmitter Sensing and Selector Levers

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator assembly as instructed in paragraph 154*b*.

(3) Remove the setscrew (1, fig. 200) that holds the sensing lever pivot stud (2) to the keyboard frame; remove the sensing lever pivot stud, catching the flat washers (3, 4, 6, 8, 10, and 12) and sensing levers (5, 7, 9, 11, and 13) as they are released by the stud.

(4) Remove the six selector lever springs (14) from the selector levers and from the selector lever spring bracket (43). Remove the sensing lever locking bail spring (15) from the sensing lever locking bail (18) and from the spring bracket (43).

(5) Remove the self-locking hexagonal nut (16) that holds the sensing lever locking bail bearing (17) and the sensing lever locking bail (18) to the selector lever pivot post (40); remove the locking bail bearing and locking lever.

(6) Remove the spacing collar (19) and the six selector levers (20, 23, 26, 29, 32, and 35), the six bearing shoes (21, 24, 27, 30, 33, and 36), and the six flat washers (22, 25, 28, 31, 34, and 37) from the selector lever pivot post, alternating selector lever, bearing shoe, and flat washer until all are removed.

(7) Remove the flat washer (38) from the selector lever pivot post (40).

(8) Remove the setscrew (39) that holds the selector lever pivot post (40) to the keyboard frame; remove the pivot post.

(9) Remove the two socket head machine screws (41) and lockwashers (42) that hold the selector lever spring bracket (43) to the keyboard frame; remove the spring bracket.

(10) Remove the two machine screws (44) and lockwashers (45) that hold the adjusting plate (46) and the selector levers comb (50) to the keyboard frame; remove the adjusting plate and the selector levers comb.

(11) Remove the two socket head screws (47) and lockwashers (48) that hold the stop selector lever latch (49) to the selector levers comb (50); remove the stop selector lever latch.

b. Reassembly.

(1) Position the stop selector lever latch (49, fig. 207) on the selector levers comb (50); secure with two socket head screws (47) and lockwashers (48).

(2) Position the selector levers comb (50) and the adjusting plate (46) on the keyboard frame; secure with two socket head screws (44) and lockwashers (45).

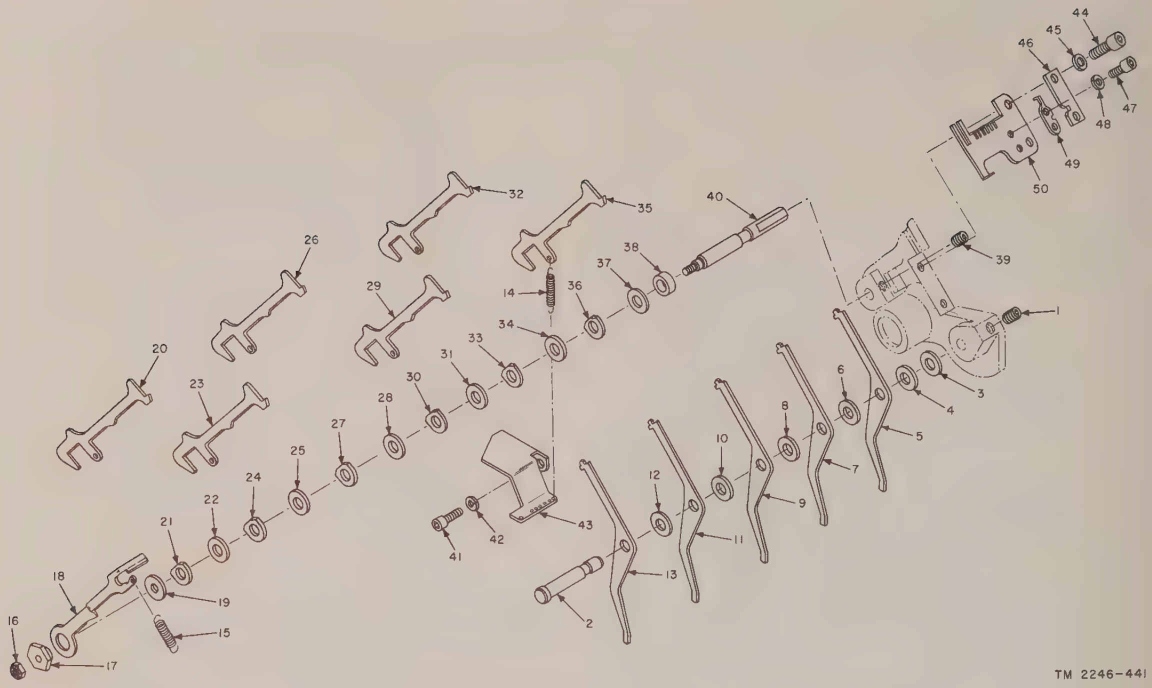
(3) Position the selector lever spring bracket (43) on the keyboard frame; secure with two machine screws (41) and lockwashers (42).

(4) Position the selector lever pivot post (40) in the drilled hole in the keyboard frame; secure with a socket head setscrew (39).

(5) Install the flat washer (38) on the selector lever pivot post (40).

(6) Position the flat washers (37, 34, 31, 28, 25, and 22), the bearing shoes (36, 33, 30, 27, 24, and 21), and the selector levers (35, 32, 29, 26, 23, and 20) on the selector lever pivot post, alternating a flat washer, bearing shoe, and selector lever until all are on. Install the spacing collar (19).

(7) Position the sensing lever locking bail (18) and sensing lever locking bail bearing (17) on the selector lever pivot post;



1 Setscrew, 10210
2 Sensing lever pivot stud, 51562
3 Flat washer, 53526
4 Flat washer, 51047 (includes items 6, 8, 10, and 12)
5 Sensing lever 51573A (includes items 7, 9, 11, and 13)
6 Flat washer
7 Sensing lever
8 Flat washer
9 Sensing lever
10 Flat washer
11 Sensing lever
12 Flat washer
13 Sensing lever
14 Selector lever spring, 50902
15 Sensing lever locking bail spring, 51575
16 Self-locking hexagonal nut, 10500
17 Sensing lever locking bail bearing, 51557
18 Sensing lever locking bail, 51567
19 Spacing collar, 51555
20 Selector lever, 51598A (includes items 23, 26, 29, 32, and 35)
21 Bearing shoe, 51644A (includes items 24, 27, 30, 33, and 36)
22 Flat washer 50147 (includes items 25, 28, 31, 34, and 37)
23 Selector lever
24 Bearing shoe
25 Flat washer
26 Selector lever
27 Bearing shoe
28 Flat washer
29 Selector lever
30 Bearing shoe
31 Flat washer
32 Selector lever
33 Bearing shoe
34 Flat washer
35 Selector lever
36 Bearing shoe
37 Flat washer
38 Flat washer 56252
39 Setscrew, 10210
40 Selector lever pivot post, 54673
41 Machine screw, 10003
42 Lockwasher, 10429
43 Selector lever spring bracket, 54672
44 Screw, 10008
45 Lockwasher, 10430
46 Adjusting plate, 55869
47 Screw, 10002
48 Lockwasher, 10429
49 Stop selector lever latch, 55870
50 Selector levers comb, 51558

Figure 200. Keyboard transmitter sensing and selector levers, exploded view.

secure with a self-locking hexagonal nut (16).

(8) Install the sensing lever locking bail spring (15) on the sensing lever locking bail and on the selector lever spring bracket (43). Install the six selector lever springs (14) on the selector levers and on the spring bracket.

(9) Position the five sensing levers (13, 11, 9, 7, and 5) and the flat washers (12, 10, 8, 6, 4, and 3) on the sensing lever pivot stud (2), alternating a sensing lever and a flat washer until all are assembled and adding an extra washer or washers at the end as required. Position the assembled stud, sensing levers, and flat washers on the keyboard frame; secure with a setscrew (1).

(10) Install the tabulator and indicator assembly as described in paragraph 154*b*.

(11) Install the keyboard transmitter on the page printer as described in paragraph 153*b*.

(12) Adjust the selector and sensing levers as directed in paragraphs 388, 389, 390, 391, and 392.

160. Disassembly and Reassembly of Keyboard XMTR Camshaft

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator assembly, as described in paragraph 154*a*.

(3) Remove the sensing and selector levers as instructed in paragraph 159*a*.

(4) Remove the two setscrews (1, fig. 201) that attach the clutch yoke (2) to the XMTR camshaft (3); remove the clutch yoke from the XMTR camshaft and remove the XMTR camshaft from the keyboard frame.

(5) Remove the machine screws (4), flat washers (5), and lockwashers (6), that hold the ball bearing (7) in the keyboard frame; remove the ball bearing (7), collar (8), and the ball bearing (9) from the frame.

b. Reassembly.

(1) Install the ball bearing (9), the collar (8), and the ball bearing (7) into the bearing opening in the keyboard frame, hold the bearings and collar in the frame with the two flat washers (5), lockwashers (6), and machine screws (4).

(2) Insert the XMTR camshaft (3) through the bearings; position the clutch yoke (2) on the XMTR camshaft and attach the clutch yoke to the XMTR camshaft with two setscrews (1).

(3) Reassemble the sensing and selector levers as described in paragraph 159*b*.

(4) Replace the tabulator and indicator assembly as described in paragraph 154*b*.

(5) Install the keyboard on the page printer as described in paragraph 153*b*,

(6) Adjust the XMTR camshaft as explained in paragraph 397.

161. Disassembly and Reassembly of Key Levers and Code Bars

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator assembly as described in paragraph 154*a*.

(3) Remove the two machine screws (1, fig. 202) and lockwashers (2) that hold the space bar (3) to the space bar arm assembly (7); remove the space bar.

(4) Remove the two retainer rings (4) and (5) that hold the space bar arm shaft (6) to the front key lever guide (41); remove the space bar arm shaft and space bar assembly.

(5) Remove the three machine screws (8) and lockwashers (9) that hold the key lever locking bar (10) to the key lever mounting bracket (21); remove the locking bar.

(6) Remove the 31 key lever springs (11) and the two space bar springs (12).

(7) Remove the assembled keytops (13) and short key levers (14), keytops and medium key levers (15), and keytops and long key levers (16). Remove the keytops from the key levers only if either is damaged.

(8) Remove the space bar lever (17) and the repeat key lever (18).

(9) Remove the four machine screws (19) and lockwashers (20) that hold the key lever mounting bracket (21) to the keyboard casting: remove the key lever mounting bracket.

(10) Remove the function blocking bar spring (22) from the function blocking bar (28).

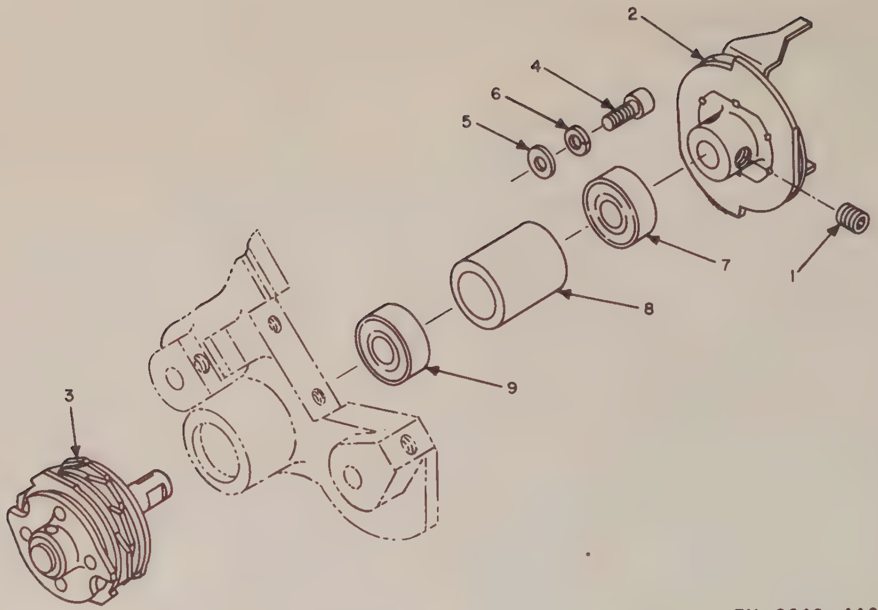
(11) Remove the self-locking hexagonal nut (23) that holds the function blocking arm (24) to the function blocking bar (28); remove the function blocking arm.

(12) Remove the two retainer rings (25), the lubricating pads (26), and remaining two retainer rings (27) that hold the tabulator function blocking bar to the front key lever guide (41): remove the function blocking bar.

(13) Remove the self-locking hexagonal nut (29) and flat washer (30) that hold the carriage-return blocking arm (31) to the carriage-return blocking bar (36); remove the carriage-return blocking arm.

(14) Remove the self-locking hexagonal nut (32) and flat washer (33) that hold the carriage-return latch lever (34) to the carriage-return blocking bar (36); remove the carriage-return latch lever.

(15) Remove the two retainer rings (35) that hold the carriage return blocking bar (36) to the studs on the front key lever guide (41); remove the carriage return blocking bar.



TM 2246—440

1 Set screw, 10209
2 Clutch yoke, 54695A
3 XMTR camshaft, 54690A
4 Machine screw, 10003
5 Flat washer, 10458
6 Lockwasher, 10429
7 Ball bearing, 10753
8 Collar, 51599
9 Ball bearing, 10753

Figure 201. Keyboard XMTR camshaft, exploded view.

(16) Remove the tabulator bar spring (37) and the universal code bar return spring (38). Remove the front key lever guide (41).

(17) Remove the two machine screws (42) and lockwashers (43) that hold the code bar guide studs (44) to the keyboard frame; remove the code bar guide studs.

(18) Remove the middle key lever guide (45), the code bars (46–50), the universal bar (51) and the tabulator bar (52).

b. Reassembly.

(1) Position the tabulator bar (52, fig. 202), the universal bar (51), the five code bars arranged in their proper sequence with code bar No. 1 (50) next to the universal bar, followed by the remaining code bars (49) through (46) and the middle key lever guide (45) on the code bar guide studs (44).

(2) Position the assembled code bar guide studs and code bars on the keyboard frame; secure with two machine screws (42) and lockwashers (43).

(3) Position the front key lever guide (41) in front of the tabulator bar (52) and install the universal code bar return spring (38) and the tabulator bar spring (37).

(4) Position the carriage return blocking bar (36) on the studs on the front key lever guide (41); secure with two retainer rings (35).

(5) Position the carriage-return latch lever (34) on the carriage-return blocking bar (36); secure with a flat washer (33) and self-locking hexagonal nut (32).

(6) Position the carriage-return blocking arm (31) on the carriage-return blocking bar (36); secure with a flat washer (30) and a self-locking hexagonal nut (29).

(7) Position the function blocking bar (28) on the studs on the front key lever guide (41); secure with two retainer rings (27), two lubricating pads (26) and the remaining two retainer rings (25).

(8) Position the function blocking arm (24) on the function blocking bar (28); secure with a self-locking hexagonal nut (23).

(9) Install the function blocking bar spring (22) on the function blocking bar (28) and on the stud on the front key lever guide (41).

(10) Position the key lever mounting bracket (21) on the keyboard casting; secure with four machine screws (19) and lockwashers (20).

(11) Install the repeat key lever (18) and the space bar lever (17).

(12) Install the assembled long key levers (16) and keytops (13) from left to right in the order given in the chart below. Similarly install the assembled medium key levers (15) and short key levers (14) and keytops from left to right as indicated in the chart below. The chart also gives the part number for each of the keytops.

KEYTOP CHART

Short Key Levers

Part No.	*Keytop*	
54001	Q	1
54002	W	2
54003	E	3
54004	R	4
54005	T	5
54006	Y	6
54007	U	7
54008	I	8
54009	O	9
54010	P	0
54011	Repeat	

Medium Key Levers

Part No.	*Keytop*	
54012	A	-
54013	S	Bell
54014	D	$
54015	F	!
54016	G	&
54017	H	Stop
54018	J	'
54019	K	(
54020	L	)
54021	Car. Ret.	

Long Key Levers

Part No.	*Keytop*	
54022	Figs.	
54023	Z	"
54024	X	/
54025	C	:
54026	V	;
54027	B	?
54028	N	,
54029	M	.
54030	Ltrs.	
54031	Line feed	

(13) Install the 31 key lever springs (11) and the two space bar springs (12).

(14) Position the key lever locking bar (10) on the key lever mounting bracket (21); secure with three machine screws (8) and lockwashers (9).

(15) Position the space bar arm assembly (7) on the front key lever guide (41); install the space bar arm shaft (6) through the holes in the space bar arm assembly and the arms of the front key lever guide. Secure with two retainer rings (4) and (5).

(16) Position the space bar (3) on the space bar arm assembly (7); secure with two machine screws (1) and lockwashers (2).

(17) Install the tabulator and indicator assembly as described in paragraph 154*a*.

(18) Install the keyboard transmitter on the page printer as described in paragraph 153*a*.

(19) Adjust the key levers and code bars as instructed in paragraphs 387, 398, 402, 403, and 404.

162. Disassembly and Reassembly of XMTR Camshaft Locking Mechanism

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator assembly as described in paragraph 154*a*.

(3) Remove the sensing levers as described in paragraph 159*a*(3).

(4) Remove the ends of the locking lever latch spring (1, fig. 203) from the pin in the keyboard frame and from the spring tab on the locking lever latch (10); remove the spring.

(5) Remove the setscrew (2) holding the locking lever latch stud (5) in the keyboard frame.

(6) Remove the ends of the repeat blocking lever spring (3) from the repeat blocking lever (6) and from the spring post on the locking lever latch (10); remove the spring.

(7) Remove the retainer ring (4) from the end of the locking lever latch stud (5).

(8) Remove the assembled locking lever latch, repeat blocking lever, and the locking lever latch stud from the keyboard frame. Disassemble the parts; remove the plain hexagonal nut (8) and the universal bar adjusting screw (9) from the locking lever latch.

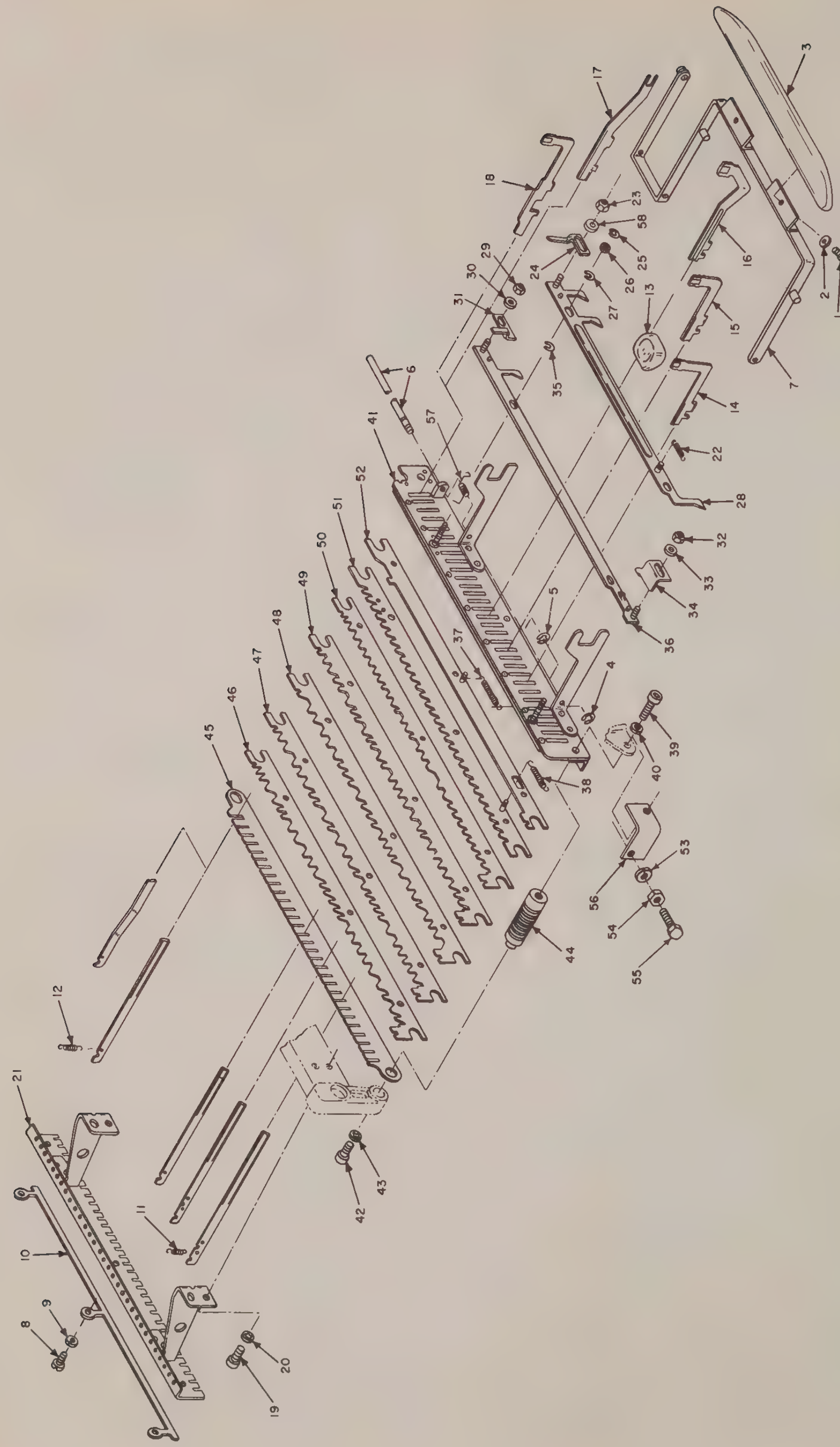
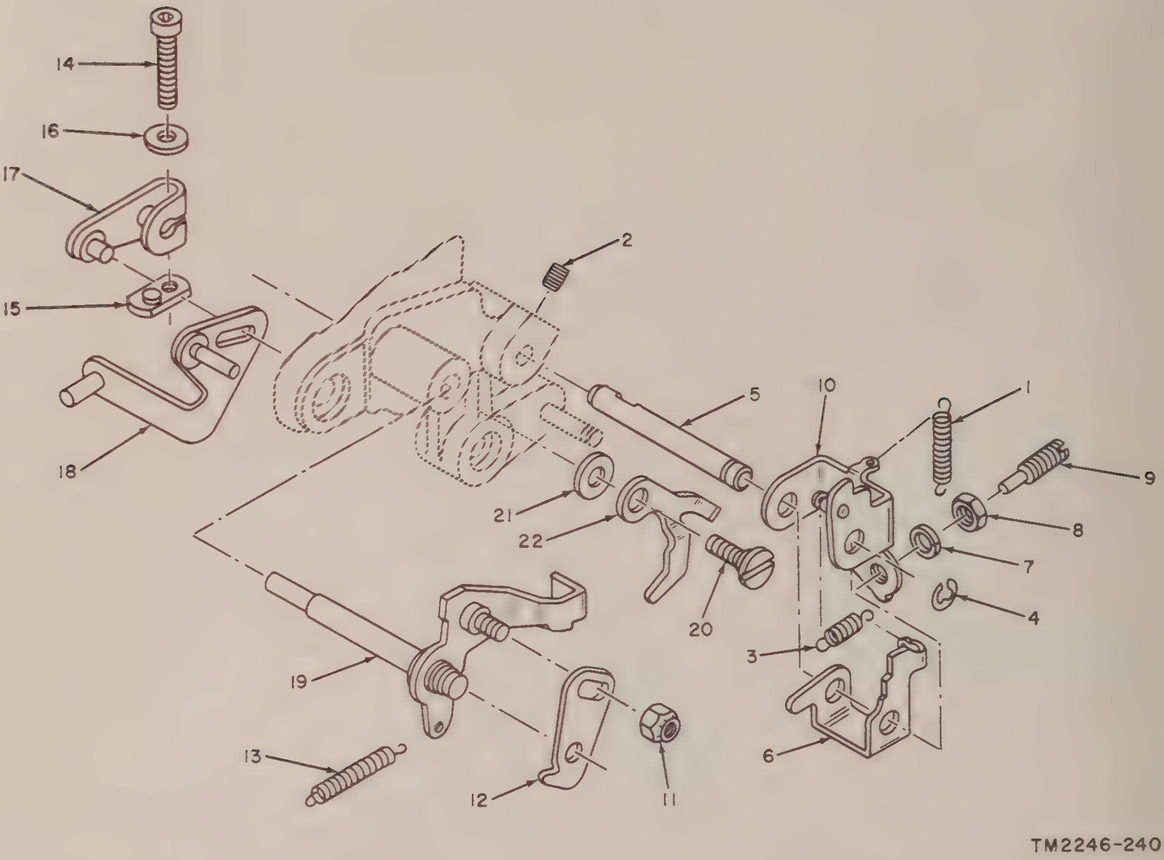


Figure 202. Key levers and code bars, exploded view.

1 Machine screw, 10001
2 Lock washer, 10429
3 Space bar, 53944A
4 Retainer ring, 10969
5 Retainer ring, 10969
6 Space bar arm shaft, 55862
7 Space bar arm assembly, 55875A
8 Machine screw, 10304
9 Lockwasher, 10429
10 Key lever locking bar, 53210
11 Key lever spring, 50941
12 Space bar spring, 53974
13 Keytop, 54001
14 Short key lever, 55917
15 Medium key lever, 55918
16 Long key lever, 53969
17 Space bar lever, 55916
18 Repeat key lever, 55915
19 Machine screw, 10015
20 Lockwasher, 10431
21 Key bar mounting bracket, 54963A
22 Function blocking bar spring, 50919
23 Self-locking hexagonal nut, 10551
24 Function blocking arm, 55976
25 Retainer ring, 10969
26 Lubricating pad, 55986
27 Retainer ring, 10969
28 Function blocking bar, 55822A
29 Self-locking hexagonal nut, 10551
30 Flat washer, 10457
31 Carriage return blocking arm, 55977
32 Self-locking hexagonal nut, 10551
33 Flat washer, 10457
34 Carriage return latch lever, 55975
35 Retainer ring, 10969
36 Carriage-return blocking bar, 55823A
37 Tabulator bar spring, 54666
38 Universal code bar return spring, 51136
39 Machine screw, 10024
40 Lockwasher, 10431
41 Front key lever guide, 55860A
42 Machine screw, 10017
43 Lockwasher, 10405
44 Code bar guide stud, 55866
45 Middle key lever guide, 52915
46 Code bar, 53299
47 Code bar, 53298
48 Code bar, 53297
49 Code bar, 53296
50 Code bar, 53295
51 Universal bar, 51134A
52 Tabulator bar, 55850A
53 Lockwasher, 10429
54 Hexagonal nut, 10512
55 Hexagonal head screw, 10080
56 Universal bar bracket, 54642
57 Spring, 56688
58 Flat washer, 10457

Figure 202—Continued.



1 Locking lever latch spring, 51544
2 Setscrew, 10219
3 Repeater blocking lever spring, 50944
4 Retainer ring, 10949
5 Locking lever latch stud, 51564
6 Repeater blocking lever, 51569
7 Lockwasher, 10409
8 Plain hexagonal nut, 10507
9 Universal bar adjusting screw, 50658
10 Locking lever latch, 51570A
11 Self-locking hexagonal nut, 10500
12 Stop latch cam follower, 55562
13 Cam-stop lever spring, 51575
14 Machine screw, 10006
15 Clamp nut, 50174
16 Flat washer, 10459
17 Switch actuating lever, 55988A
18 Switch arm, 55835A
19 Cam-stop lever, 54686A
20 Repeat lever pivot stud, 51568
21 Flat washer, 50414
22 Repeater lever, 52914

Figure 203. XMTR camshaft locking mechanism, exploded view.

(9) Remove the self-locking hexagonal nut (11) from the threaded stud of the cam stop lever (19); remove the stop latch cam follower (12) from the cam stop lever.

(10) Remove the cam-stop lever spring (13) from the angle bracket on the casting end from the bottom of the cam-stop lever.

(11) Remove the machine screw (14) and the flat washer (16) from the clamp nut (15); remove the switch actuating lever (17) from the shaft of the cam-stop lever (19).

(12) Remove the switch arm (18) from the keyboard frame.

(13) Remove the cam-stop lever (19).

(14) Remove the repeat lever pivot stud (20), flat washer (21), and repeat lever (22) from the keyboard frame.

b. Reassembly.

(1) Position the flat washer (21) and the repeat lever (22) on the casting; attach with the repeat lever pivot stud (20).

(2) Insert the shaft of the cam-stop lever (19) in the bushing in the keyboard frame.

(3) Insert the pin of the switch arm (18) in the keyboard frame.

(4) Install the switch actuating lever (17) on the shaft of the cam-stop lever (19) with the pin of the switch actuating lever in the slot of the switch arm (18).

(5) Place the clamp nut (15) on the bottom of the switch actuating lever (17). Hold the switch actuating lever to the shaft of the cam-stop lever (19) with a flat washer (16) and machine screw (14).

(6) Attach one end of the cam-stop lever spring (13) to the bottom of the cam-stop lever (19); attach the other end of the spring to the angle bracket on the keyboard frame.

(7) Install the stop latch cam follower (12) on the shaft and on the threaded stud of the cam stop lever (19); attach with a self-locking hexagonal nut (11).

(8) Screw the plain hexagonal nut (8) on the universal bar adjusting screw (9); screw the adjusting screw to its former approximate position on the locking lever latch (10) and lock with the nut.

(9) Place the repeat blocking lever (6) in the locking lever latch (10); position both the lever and latch on the locking lever latch stud (5). Install the locking lever latch stud and assembled lever and latch on the keyboard frame.

(10) Install the retainer ring (4) on the end of the locking lever latch stud (5).

(11) Hook the ends of the repeat blocking lever spring (3) to the spring post on the locking lever latch (10) and on the tab on the repeat blocking lever (6).

(12) Install the setscrew (2) in the keyboard frame and tighten to hold the locking lever latch stud (5) securely.

(13) Hook the ends of the locking lever latch spring (1) on the spring tab on the top of the locking lever latch (10) and on the pin in the casting.

(14) Install the sensing levers as described in paragraph 159*b*(9).

(15) Install the tabulator and indicator assembly as described in paragraph 154*b*.

(16) Install the keyboard on the page printer as described in paragraph 153*b*.

(17) Adjust the locking mechanism as instructed in paragraphs 398, 405, 406, and 407.

163. Disassembly and Reassembly of Simultaneous Transmitter Mechanism

(fig. 204)

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator mechanism as described in paragraph 154*a*.

(3) Remove the two machine screws (1) and two lockwashers (2) that hold the keyboard switch cover (3) in place; remove the cover.

(4) Pull out the shunt switch arm connector (4) from the shunt switch arm comb (13).

(5) Remove the two socket mounting studs (5), flat washers (6), and lockwashers (7) that attach the shunt switch arm comb (13) to the keyboard frame.

(6) Remove the two machine screws (8) and lockwashers (9) that attach the shunt switch arm spring mounting bracket (12) to the shunt switch arm comb (13).

(7) Remove the shunt switch arm comb and unsolder the electrical leads.

(8) Remove the set screw (14) that holds the switch arm mounting post pivot (15) in the keyboard frame; remove the switch arm mounting post pivot with the tabulator lever (32) and the switch arms (19, 21, 23, 25, and 27) assembled on it.

(9) Remove the switch arm mounting post pivot (15) from the tabulator lever (32) and switch arms; remove the retainer ring (16) from the switch arm centering sleeve (28).

(10) Slide the switch arm centering sleeve from the tabulator lever (32), removing the flat washer (17), and the switch arm spacers (18, 20, 22, 24, and 26) and switch arms (19, 21, 23, 25, and 27) alternately.

(11) Remove the self-locking hexagonal nut (29) from the machine screw (30); remove the tabulator lever adjusting arm (31) from the tabulator lever (32).

b. Reassembly.

(1) Position the tabulator lever adjusting arm (31) on the tabulator lever (32); attach with a machine screw (30) and self-locking hexagonal nut (29).

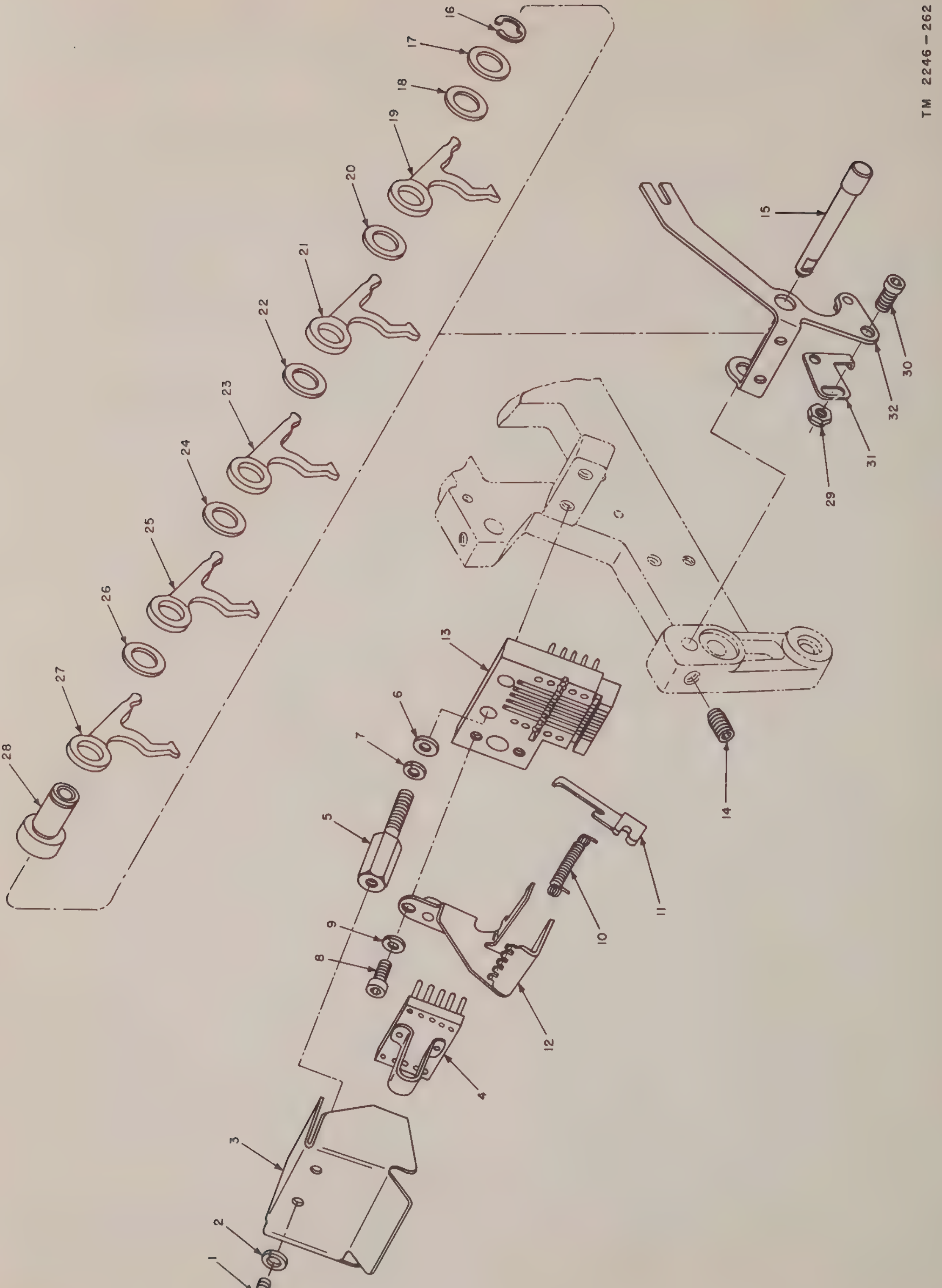


Figure 204. Simultaneous transmitter mechanism exploded view.

1 Machine screw, 10032
2 Lock washer, 10430
3 Keyboard switch cover, 55889
4 Shunt switch arm connector, 55885A
5 Socket mounting stud, 55898
6 Flat washer, 10467
7 Lock washer, 10430
8 Machine screw, 10004
9 Lock washer, 10429
10 Shunt switch arm spring
11 Shunting switch arm
12 Shunt switch arm spring mounting bracket, 55903A (includes items 10 and 11)
13 Shunt switch arm comb, 55855
14 Set screw, 10210
15 Switch arm mounting post pivot, 55828
16 Retainer ring, 10959
17 Flat washer, 50552
18 Switch arm spacer, 55878
19 Switch arm, 55894
20 Switch arm spacer, 55878
21 Switch arm, 55894
22 Switch arm spacer, 55878
23 Switch arm, 55894
24 Switch arm spacer, 55878
25 Switch arm, 55894
26 Switch arm spacer, 55878
27 Switch arm, 55894
28 Switch arm centering sleeve, 55895
29 Self-locking hexagon nut, 10500
30 Machine screw, 10001
31 Tabulator lever adjusting arm, 55901
32 Tabulator lever, 55900A

Figure 204—Continued.

(2) Start the switch arm centering sleeve (28) in the tabulator lever (32); place the switch arms (27, 25, 23, 21, and 19) and the switch arm spacers (26, 24, 22, 20, and 18) alternately on the centering sleeve.

(3) Place the flat washer (17) on the switch arm centering sleeve (28); secure the assembled switch arms on the centering sleeve with the retainer ring (16).

(4) Insert the switch arm mounting post pivot (15) through the switch arm centering sleeve (29); position the tabulator lever (32) and the assembled switch arms on the casting and hold the switch arm mounting post pivot (15) and the setscrew (14).

(5) Position the shunt switch arm spring mounting bracket (12) on the shunt switch arm comb (13); hold with two lockwashers (9) and two machine screws (8).

(6) Attach the shunt switch arm comb (13) to the casting with two lockwashers (7), flat washers (6), and socket mounting studs (5). Solder the electrical leads to the terminals of the shunt switch arm comb.

(7) Plug the shunt switch arm connector (4) into the shunt switch arm comb (13).

(8) Position the keyboard switch cover (3) on the socket mounting studs; attach with two lockwashers (2) and machine screws (1).

(9) Install the tabulator and indicator assembly as instructed in paragraph 154*b*.

(10) Install the keyboard transmitter as instructed in paragraph 153*b*.

(11) Adjust the keyboard simultaneous transmitting mechanism as instructed in paragraphs 393 and 394.

164. Removal and Replacement of the Keyboard Filter Mounting Bracket

a. Removal.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the tabulator and indicator assembly as described in paragraph 154*a*.

(3) Remove the simultaneous transmitting mechanism as described in paragraph 163*a*(3) through (8).

Note. It is not necessary to disassemble the simultaneous transmitter mechanism any farther than the removal of the shunt switch arm (13, fig. 204). Do not remove the wires from the shunt switch arm comb unless the entire keyboard filter mounting bracket is going to be disassembled. The shunt switch arm comb will pass through the opening in the frame without removing the electrical leads.

(4) Remove the two machine screws (1, fig. 205) and internal tooth lockwashers (2) that hold the right side of the filter switch cover (6) to the spacing post studs (7). Remove the machine screw (3), flat washer (4), and lockwasher (5) that hold the left side of the filter switch cover to the spacing post stud (9); remove the filter switch cover.

(5) Remove the two spacing post studs (7) and internal tooth lockwashers (8) that hold the right side of the keyboard filter mounting bracket assembly to the keyboard frame. Remove the spacing post stud (9), lockwasher (10), washer (44), machine screw (45), and lockwasher (46) that hold the left side of the filter mounting bracket to the boss on the keyboard frame. Shift the assembly slightly to the right to clear the switch actuating arm at the left of the keyboard frame and lift the filter mounting bracket assembly free. If the shunt switch arm comb (13, fig. 204) has not been disconnected from the electrical leads (see *note* in (3) above), thread the shunt switch arm comb through the opening in the keyboard frame and remove the filter mounting bracket assembly.

b. Replacement.

(1) Carefully thread the shunt switch arm comb (13, fig. 204) through the opening in the keyboard frame. Position the filter mounting bracket assembly on the keyboard frame; secure the left side with the spacing post stud (9, fig. 205) lockwasher (10), and washer (44), machine screw (45) and lockwasher (46) and the right side with two spacing post studs (7) and lockwashers (8).

(2) Position the filter switch cover (6) on the spacing post studs (7 and 9). Secure the left side with a machine screw (3), lockwasher (5), and a flat washer (4). Secure

the right side with two machine screws (1) and internal tooth lockwashers (2).

(3) Reassemble the simultaneous transmitter mechanism as described in paragraph 163*b*(6) through (9).

(4) Replace the tabulator and indicator assembly as described in paragraph 154*b*.

(5) Replace the keyboard transmitter on the page printer as described in paragarph 153*b*.

165. Disassembly and Reassembly of Keyboard Filter Mounting Bracket

a. Disassembly.

(1) Remove the keyboard filter mounting bracket as described in paragraph 164*a*.

(2) Remove the two retainer rings (11 and 12, fig. 205) that holed the keyboard counter cam follower pivot (13) to the keyboard filter mounting bracket (42); remove the keyboard counter cam follower pivot, two lubricating pads (14), the keyboard counter cam follower spring (15), and the keyboard counter cam follower (19).

(3) Remove the hexagonal nut (17), lockwasher (18), and machine screw (16), from the keyboard counter cam follower (19).

(4) Remove the two machine screws (20) and lockwashers (21) that hold the keyboard pulsing contact filter (22) to the keyboard filter mounting bracket (42); unsolder the leads and remove the filter. Tag the leads to facilitate reassembly.

(5) Remove the two machine screws (23) lockwashers (24) and washer (43) that hold the keyboard counter and keyboard reader contact assembly (25) to the keyboard filter mounting bracket (42); remove the contact assembly.

(6) Remove the plunger (57), spring (49), plunger (48), and shims (47) from the keyboard counter and keyboard reader contact assembly (25).

(7) Remove the self-locking hexagonal nut (50), washer (51), plate (52), resistor (53), plate (54), and washer (55) from the machine screw (56); remove the machine screw (56) from the keyboard filter mounting bracket (42).

(8) Remove the self-locking hexagonal nut (26) and the machine screw (27) that hold the bottom of the terminal board (36) to the keyboard filter mounting bracket (42).

(9) Remove the self-locking hexagonal nut (28), internal tooth lockwasher (29), internal tooth lockwasher (31), and clamp (32) from the top terminal board mounting machine screw (34).

(10) Remove the self-locking hexagonal nut (33), machine screw (34), and internal tooth lockwasher (35) that hold the top of the terminal board (36) to the keyboard filter mounting bracket (42). If they are not already removed, disconnect the leads from the shunt switch cam comb (13, fig. 204) and pull the cable (40, fig. 205) through the opening in the terminal board. Unsolder the remaining electrical leads from the terminal board. Tag the leads to facilitate reassembly.

(11) Remove the round cable nut (37), the cable retainer (38), and the hexagonal cable nut (39) from the cable and remove the cable (40) from the keyboard filter mounting bracket (42).

(12) Remove the cable (41) from the opening in the keyboard filter mounting bracket.

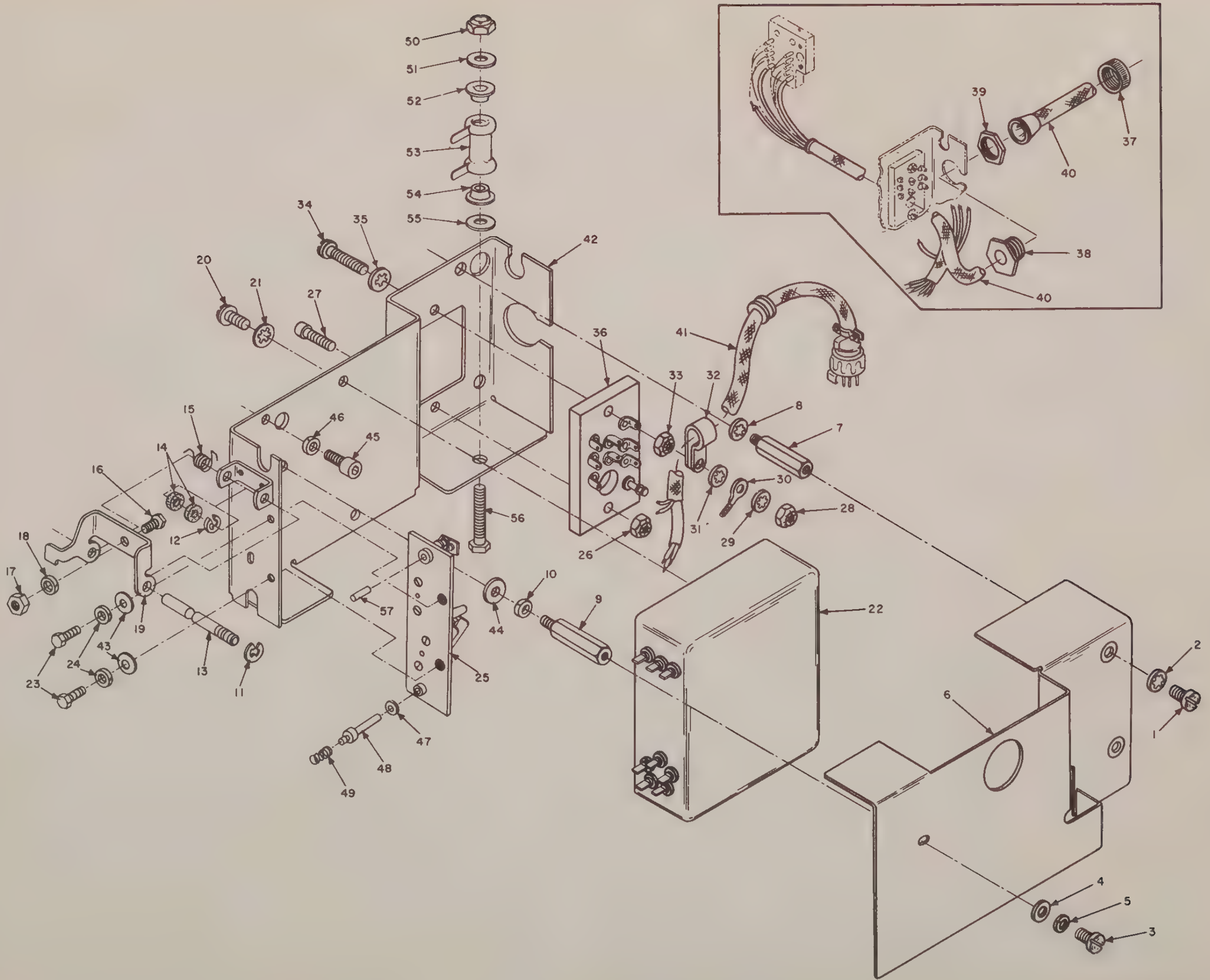
b. Reassembly.

(1) Insert the cable (41) in the top opening in keyboard filter mounting bracket (42).

(2) Position the cable (40) in the larger opening in the filter mounting bracket; secure with the cable retainer (38), the hexagonal cable nut (39), and the round cable nut (37).

(3) Solder the electrical leads to the terminal board (36). Position the terminal board on the keyboard filter mounting bracket (42); secure the top of the terminal board to the bracket with a machine screw (34), internal tooth lockwasher (35), and self-locking hexagonal nut (33). Thread the end of cable (40) through the opening in the terminal board. Connect the leads from the cable to the shunt switch arm comb (13, fig. 204).

(4) Position the clamp (32, fig. 205) around the cable (41) and position the clamp on the upper mounting machine screw (34) of the terminal board (36); install an internal tooth lockwasher (31), terminal lug (30), internal tooth lockwasher (29),

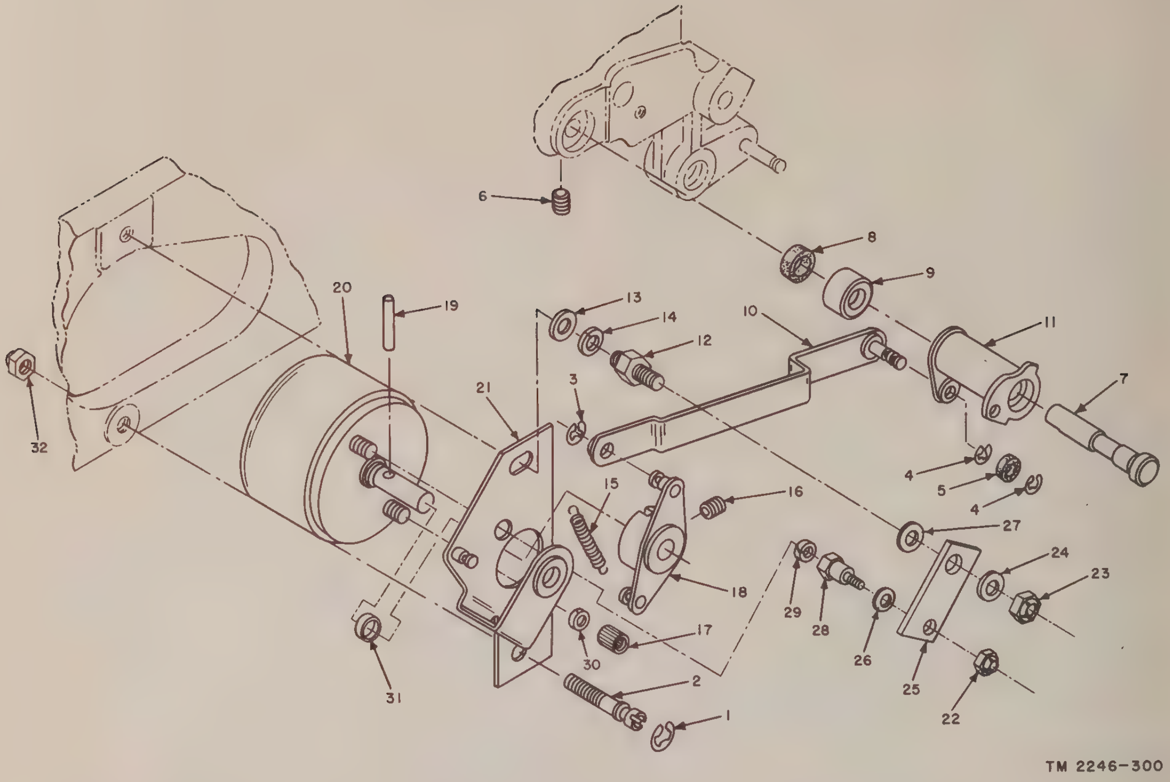


TM 2246-341

Figure 205. Keyboard filter mounting bracket, exploded view.

1	Machine screw, 10393
2	Internal tooth lock washer, 10403
3	Machine screw, 10393
4	Flat washer, 10450
5	Lockwasher, 10429
6	Filter switch cover, 55907
7	Spacing post stud, 55921
8	Internal tooth lockwasher, 10404
9	Spacing post stud, 55909
10	Lockwasher, 10429
11	Retainer ring, 10960
12	Retainer ring, 10960
13	Keyboard counter cam follower pivot, 55998
14	Lubricating pad, 55986
15	Keyboard counter cam follower spring, 55999
16	Machine screw, 54648
17	Hexagonal nut, 10507
18	Lockwasher, 10426
19	Keyboard counter cam follower, 55834
20	Machine screw, 10376
21	Lockwasher, 10404
22	Keyboard pulsing contact filter, 54567A
23	Machine screw, 10398
24	Lockwasher, 10429
25	Keyboard counter and keyboard reader contact assembly, 55910A.
26	Self-locking hexagonal nut, 10500
27	Machine screw, 10005
28	Self-locking hexagonal nut, 10512
29	Lockwasher, 10403
30	Terminal lug, 20379
31	Internal tooth lockwasher, 10403
32	Clamp, 20519
33	Self-locking hexagonal nut, 10500
34	Machine screw, 10161
35	Lockwasher, 10403
36	Terminal board, 55905A
37	Round cable nut, (part of No. 55855A, which also includes items 38, 39, and 40)
38	Cable retainer
39	Hexagonal cable nut
40	Cable
41	Cable, 56310A
42	Keyboard filter mounting bracket, 55880A
43	Washer, 10458
44	Washer, 50839
45	Machine screw, 10025
46	Lockwasher, 10404
47	Shim, 54643
48	Plunger, 54646 (items 48 and 49, part No. 54645A).
49	Spring, 54644
50	Self-locking hexagonal nut, 10500
51	Washer, 54561
52	Plate, 20878
53	Resistor, 20044
54	Plate, 20878
55	Washer, 54561
56	Machine screw, 10082
57	Plunger, 54647

Figure 205—Continued.



1	Retainer ring, 10949
2	Pivot stud, 55881
3	Retainer ring, 10969 (2 rqr)
4	Retainer ring, 10969
5	Lubricating pad, 55986
6	Set screw, 10211
7	Stop latch cam post, 55987
8	Lubricating washer, 55984
9	Stop latch cam spacing collar, 55983
10	Actuating link, 55854A
11	Stop latch cam, 55980A
12	Stud, 55912
13	Flat washer, 10454
14	Lockwasher, 10430
15	Link arm spring, 55135
16	Setscrew, 10232
17	Socket nut, 10581 (2 rqr)
18	Link arm assembly, 55872
19	Pin, 55842
20	Restoring solenoid (L1), 20304
21	Restoring solenoid mounting bracket, 55825A
22	Nut, 10500
23	Nut, 10501
24	Washer, 10454
25	Stop plate, 55893
26	Washer, 10459
27	Washer, 10454
28	Stud, 55944
29	Lockwasher, 10429
30	Lockwasher, 10429
31	Spacer, 55947
32	Nut, 10501

Figure 206. Transmitter restoring solenoid and linkage, exploded view.

and self-locking hexagonal nut (28) to secure the clamp.

(5) Secure the bottom of the terminal board (36) to the keyboard filter mounting bracket with a machine screw (27) and self-locking hexagonal nut (26).

(6) Replace the machine screw (56) in the keyboard filter mounting bracket (42). Replace washer (55), plate (54), resistor (53), plate (52), and (washer (51) or machine screw (56) and secure in place with the self-locking hexagonal nut (50).

(7) Replace the plunger (57), spring (49), plunger (48), and shims (47) in the keyboard counter and keyboard reader contact assembly (25).

(8) Position the keyboard counter and keyboard reader contact assembly (25) on the keyboard filter mounting bracket (42); secure with two machine screws (23) and lockwashers (24).

(9) Connect the leads to the keyboard pulsing contact filter (22). Position the filter on the keyboard filter mounting bracket (42); secure with two machine screws (20) and internal tooth lockwashers (21).

(10) Install the machine screw (16), lockwasher (18), and hexagonal nut (17) on the keyboard counter cam follower (19).

(11) Position the keyboard counter cam follower (19) on the arms of the keyboard filter mounting bracket (42).

Install the keyboard counter cam follower pivot (13), keyboard counter cam follower spring (15), and two lubricating pads (14); secure with two retainer rings (11 and 12).

(12) Replace the reassembled filter mounting bracket as described in paragraph 164*b*.

(13) Adjust the filter as described in paragraph 405.

166. Disassembly and Reassembly of Transmitter Restoring Solenoid and Linkage

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 154*a*.

(2) Remove the retainer ring (1, fig. 206), nut (32), and bracket pivot stud (2).

(3) Remove the sensing and selector levers as described in paragraph 159*a*.

(4) Slide the front key lever guide (41, fig. 202) forward.

(5) Remove the retainer ring (1, fig. 206) and the bracket pivot stud (2).

(6) Remove the retainer ring (3) from the pivot stud on the link arm assembly (18) and remove the two retainer rings (4) and the lubricating pad (5).

(7) Remove the setscrew (6) that attaches the stop latch cam post (7) to the keyboard frame; remove the stop latch cam post, lubricating washer (8), stop latch cam spacing collar (9), actuating link (10), and the stop latch cam (11).

(8) Remove the nuts (22 and 23) and washer (24) that secure the stop plate (25) and remove the stop plate.

(9) Remove the washers (26 and 27), studs (12 and 28), lockwashers (14 and 29), and washer (13) that secure the restoring solenoid mounting bracket (21) to the keyboard frame.

(10) Remove one end of the link arm spring (15) from the spring post on the restoring solenoid mounting bracket (21), and the other end from the spring post on the link arm assembly (18).

(11) Remove the setscrew (16) from the link arm assembly (18).

(12) Remove the socket head nut (17), and lockwasher (30) from the restoring solenoid (20); remove the link arm assembly (18) as the restoring solenoid is removed from the restoring solenoid mounting bracket (21).

(13) Drive the pin (19) from the shaft of the restoring solenoid (20); remove spacer (31).

(14) Remove the electrical leads from the restoring solenoid (20).

b. Reassembly.

(1) Connect the electrical leads to the restoring solenoid (20).

(2) Install spacer (31) on the shaft of the restoring solenoid (20). Drive the pin (19) into the shaft of the restoring solenoid (20).

(3) Position the restoring solenoid in the restoring solenoid mounting bracket with the link arm assembly (18) on the shaft of the restoring solenoid (20); attach the restoring solenoid to the mounting bracket with socket nut (17) and lockwasher (30).

(4) Hold the link arm assembly (18) on the shaft of the restoring solenoid with a setscrew (16).

(5) Hook one end of the link arm spring (15) to the spring post on the link arm assembly (18), and the other end to the spring post on the restoring solenoid mounting bracket (21).

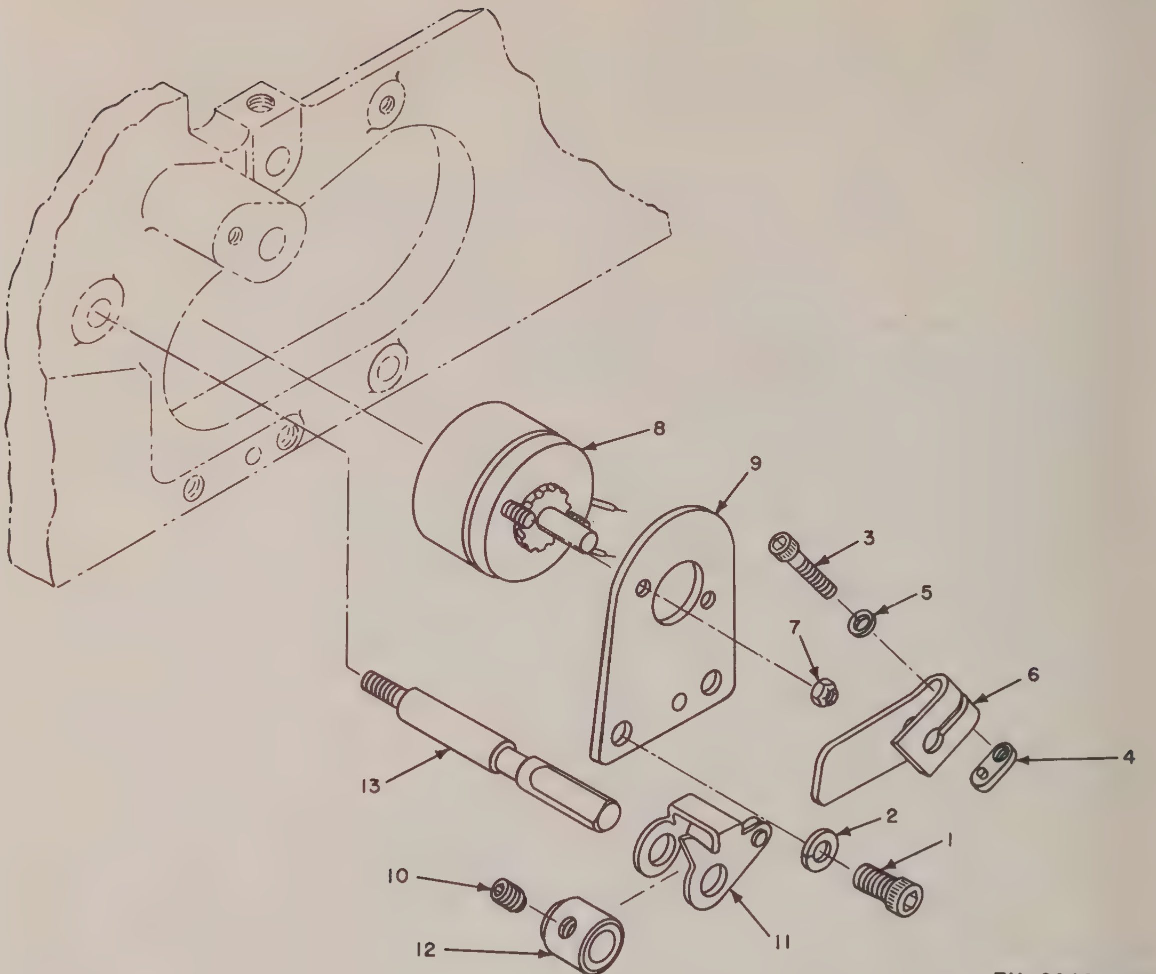
(6) Attach the restoring solenoid mounting bracket (21) to the keyboard frame with washer (13), lockwashers (14 and 29), studs (12 and 28), washers (26 and 27), stop plate (25), washer (24), and nuts (22 and 23). Adjust the stop plate as described in paragraphs 400 and 401.

(7) Position the stop latch cam (11), actuation link (10), stop latch cam spacing collar (9), and lubricating washer (8) on the keyboard frame; insert the stop latch cam post (7) through the assembly and into the keyboard frame. Hold the stop latch cam post in the keyboard frame with a setscrew (6).

(8) Hold the actuating link (10) on the pivot stud on the stop latch cam (11) with two retainer rings (4) and the lubricating pad (5).

(9) Hold the actuating link (10) on the pivot stud on the link arm assembly (18) with a retainer ring (3).

(10) Install the pivot stud (2) through the restoring solenoid mounting bracket (21) and into the keyboard frame; install the



No.	Item
1	Machine screw, 10025
2	Lockwasher, 10430
3	Machine screw, 10006
4	Anchor nut, 50174
5	Flat washer, 10459
6	Cam arm, 55841
7	Self-locking hexagonal nuts, 10580
8	XMTR lock solenoid L2, 20305
9	XMTR lock solenoid mounting plate, 55843
10	Set screw, 10209
11	Lockup lever, 56291A
12	Spacing collar, 55845
13	Transmitter lever post pivot, 54673

Figure 207. XMTR cam lock solenoid and linkage, exploded view.

retainer ring (1) and nut (32) on the bracket pivot stud.

(11) Slide the front key lever guide (41, fig. 202) back.

(12) Install the sensing and selector levers as described in paragraph 159*b*.

(13) Install the tabulator and indicator assembly as described in paragraph 154*b*.

(14) Adjust the restoring solenoid and linkage as described in paragraph 400.

(15) Install the keyboard transmitter on the page printer as described in paragraph 153*b*.

167. Disassembly and Reassembly of XMTR Lock Solenoid and Linkage

(fig. 207)

a. Disassembly.

(1) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(2) Remove the filter mounting bracket as described in paragraph 164*a*.

(3) Remove the two machine screws (1, fig. 207) and the two lockwashers (2) that attach the XMTR lock solenoid mounting plate (9) to the keyboard frame.

(4) Remove the machine screw (3) from the anchor nut (4); remove the flat washer (5) and the cam arm (6) from the shaft of the XMTR lock solenoid mounting plate (9); remove the solenoid from the mounting plate.

(6) Remove the setscrew (10) from the spacing collar (12); remove the lockup lever (11) and spacing collar from the transmitter lever post pivot (13).

(7) Remove the transmitter lever post pivot.

b. Reassembly.

(1) Install the transmitter lever post pivot (13, fig. 207).

(2) Position the spacing collar (12) in the lockup lever (11).

(3) Position the lockup lever (11) on the transmitter lever post pivot (13); attach the spacing collar to the transmitter lever post pivot with the setscrew (10).

(4) Position the XMTR lock solenoid (8) on the XMTR lock solenoid mounting plate (9); attach with two self-locking hexagonal nuts (7).

(5) Position the cam arm (6) on the shaft of the XMTR lock solenoid; attach the lockup arm lever with the flat washer (5), anchor nut (4), and machine screw (3).

(6) Position the XMTR lock solenoid mounting plate (9) on the keyboard frame; attach with two lockwashers (2) and two machine screws (1).

(7) Install the filter mounting bracket as described in paragraph 164*b*.

(8) Adjust the XMTR cam lock solenoid and linkage as described in paragraph 397.

(9) Install the keyboard transmitter on the page printer as described in paragraph 153*b*.

168. Removal and Replacement of Motor

a. Removal.

(1) Lift the left side of the page printer and disconnect the motor plug connector from the receptacle connector in the printer base.

(2) Remove the four machine screws (1, fig. 208) and lockwashers (2) that hold the gear cover (6) to the frame assembly (51); remove the worm gear bracket (9); gear cover, and gasket (3).

(3) Remove the four machine screws (1, fig. 209) and lockwashers (2) that hold the motor to the printer frame; remove the assembled motor by moving it sideways away from the frame.

(4) Remove the shims (3) from the right and left spacer plates (6 and 7).

b. Replacement.

(1) Position the shims (3, fig. 209) on the right and left spacer plates (6 and 7) so that the holes in the shims line up with the holes in the spacer plates.

(2) Position the motor on the printer frame; secure with two machine screws (1) and lockwashers (2).

(3) Position the gasket (3, fig. 208), gear cover (6), and worm gear bracket (9) on the printer frame; secure with four machine screws (1) and lockwashers (2).

(4) Lift the left side of the page printer and connect the motor plug connector to the receptacle in the printer base.

169. Disassembly and Reassembly of Synchronous Motor

(fig. 209)

a. Disassembly.

(1) Remove the motor from the page printer as described in paragraph 168*a*.

(2) Remove the four machine screws (4) and lockwashers (5) that hold the right spacer plate (6) and the left spacer plate (7) to the motor; remove the spacer plates.

(3) Remove the machine screw (8) and lock washer (9) that hold the worm gear (10) to the shaft of the motor armature (22). Hold on to the blower wheel (12) to prevent the shaft from turning while removing the screw. Remove the worm gear (10).

Note. Make sure to install the correct gear for the operating speed desired (par. 29). Make sure the mating gear is marked for the same speed (par. 197).

(4) Remove the setscrew (11) that holds the blower wheel (12) to the armature shaft; remove the blower wheel.

(5) Tap the pin (13) from the armature shaft and remove the two grease seals (14) from the shaft.

(6) Remove the plug connector (15) from the motor leads and remove the plastic tubing (16) from the leads.

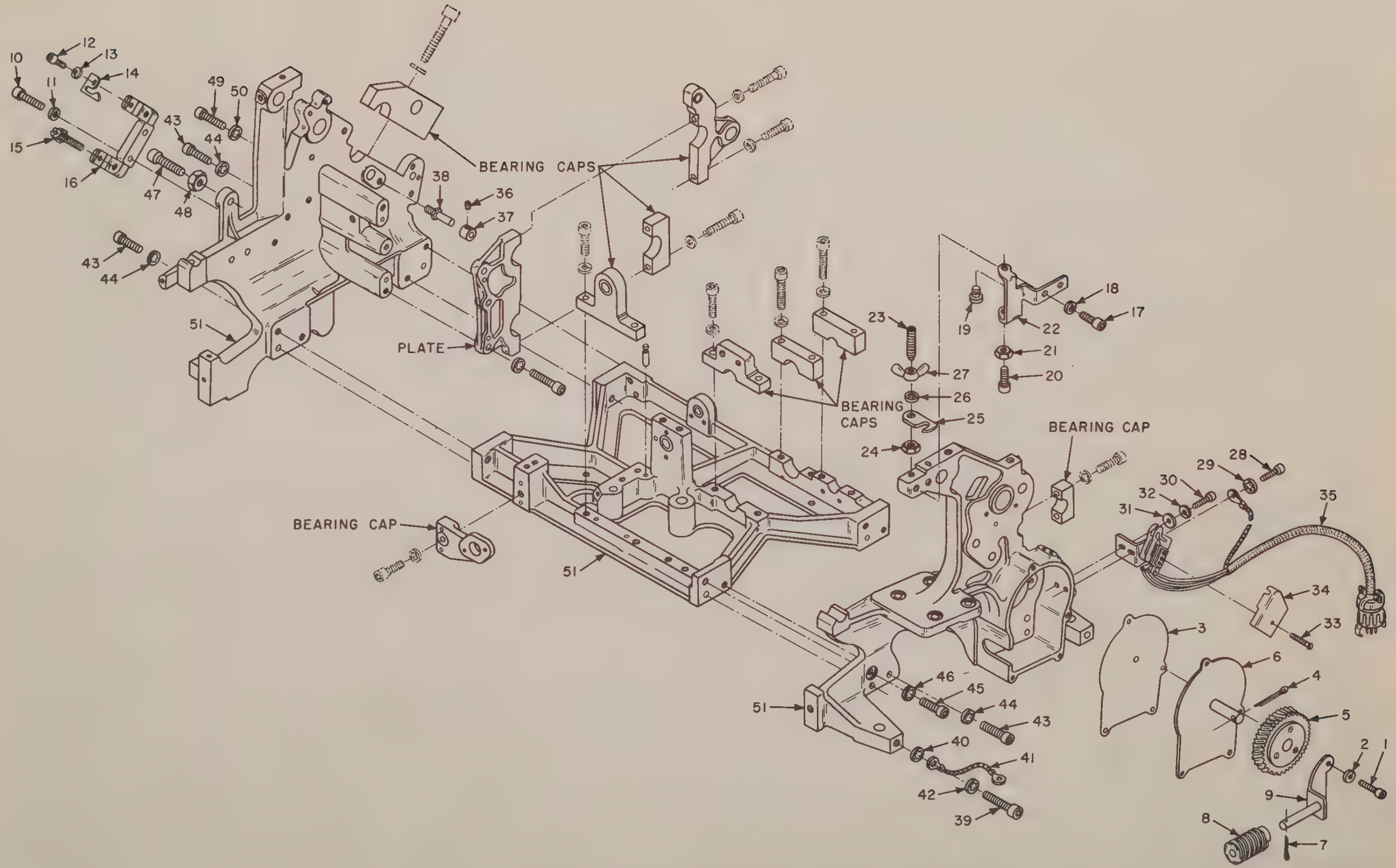


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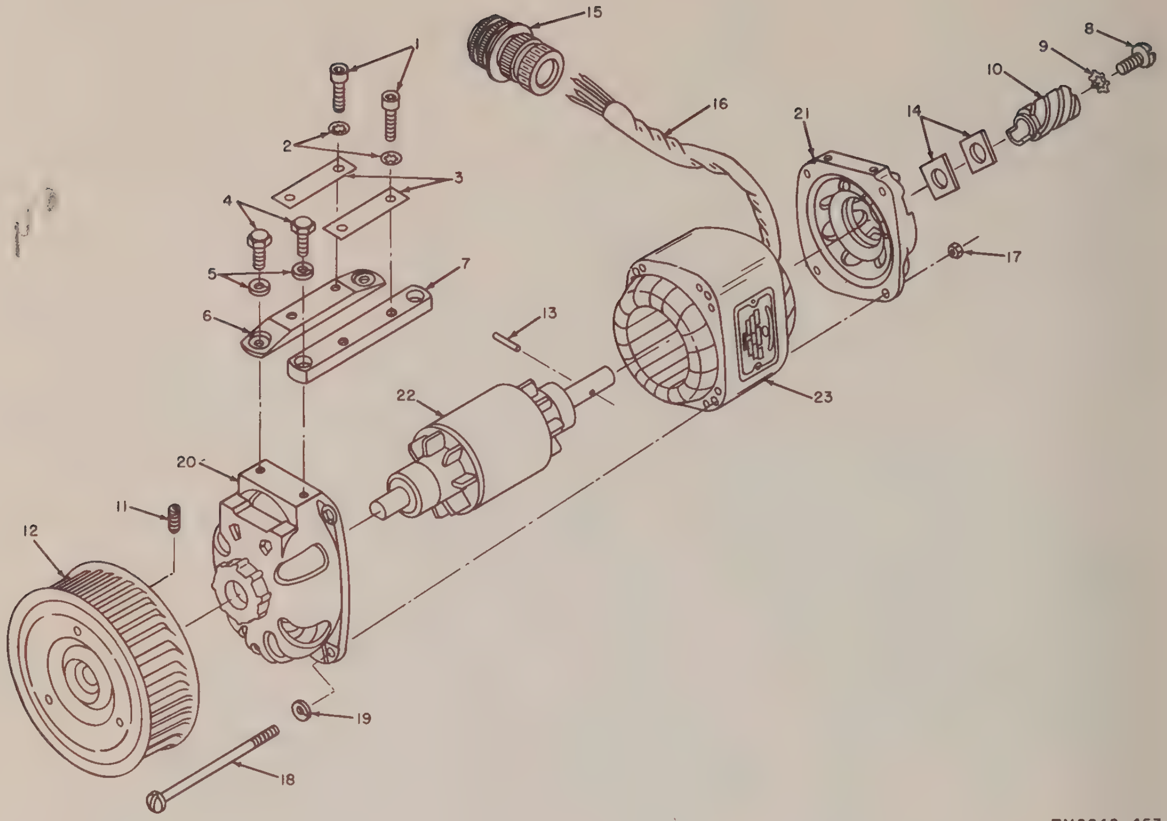
Figure 208. Page printing mechanism frame assembly, exploded view.

1 Machine screw, 10004
2 Lockwasher, 10429
3 Gasket, 50725
4 Cotter pin, 10805
5 Main shaft driven gear, 50597A
6 Gear cover, 51381A
7 Cotter pin, 10805
8 Worm gear, 50596
9 Worm gear bracket, 50858A
10 Machine screw, 10010
11 Lockwasher, 10430
12 Machine screw, 10004
13 Lockwasher, 10429
14 Anchor plate, 52687
15 Adjustment screw, 52688
16 Bracket, 52527
17 Machine screw, 10076
18 Lockwasher, 10430
19 Bumper, 20762
20 Machine screw, 10009
21 Plain hexagonal nut, 10516
22 Platen bracket, 51464
23 Setscrew, 10212
24 Plain hexagonal nut, 10509
25 Platen lock, 50598
26 Lockwasher, 10431
27 Plain wing nut, 10508
28 Machine screw, 10003
29 Lockwasher, 10403
30 Machine screw, 10003
31 Flat washer, 10459
32 Lockwasher, 10429
33 Machine screw, 10386
34 Contact shield, 53116
35 Motor stop switch assembly S1, 53330A
36 Setscrew, 10201
37 Spacing collar, 51717
38 Cam follower stop stud, 51719
39 Machine screw, 10042
40 Lockwasher, 10405
41 Electrical lead, 53651
42 Lockwasher, 10405
43 Machine screw, 10018–01
44 Lockwasher, 10405
45 Machine screw, 10024
46 Lockwasher, 10405
47 Machine screw, 10021
48 Plain hexagonal nut, 10502
49 Machine screw, 10026–01
50 Lockwasher, 10405
51 Frame assembly, 55700A (includes bearing caps, three main castings, plate dowels, and spring posts)

Figure 208—Continued.



1 Machine screw, 10017.011
2 Lockwasher, 10405
3 Shim, 51510
4 Machine screw, 10399
5 Lockwasher, 10430
6 Right spacer plate, 53478
7 Left spacer plate, 53479
8 Machine screw, 50207
9 Lockwasher, 10406
10 Worm gear, 50350
11 Setscrew, 10210
12 Blower wheel, 20839
13 Pin, 50359
14 Grease seal, 50949
15 Plug connector, 53514A
16 Plastic tubing, 20814
17 High hexagonal nut (part of 52470A which includes items 18, 19, 20, 21, 22, and 23)
18 Through bolt
19 Lockwasher
20 Rear end casting
21 Front end casting
22 Motor armature, 53361A
23 Motor stator, 53362A

Figure 209. Synchronous motor, exploded view.

(7) Remove the four high hexagonal nuts (17), through bolts (18), and lockwashers (19) that hold the rear end casting (20) and the front end casting (21) to the motor stator (23); remove the motor end castings.

(8) Remove the motor armature (22) from the motor stator (23).

b. Reassembly.

(1) Position the motor armature (22, fig. 209) in the motor stator (23).

(2) Position the front end casting (21) and the rear end casting (20) on the motor stator (23); secure with four through bolts (18), lockwashers (19), and high hexagonal nuts (17). Be sure to thread the motor leads through the proper opening in the front end frame before installing.

(3) Install the plastic tubing (16) on the motor leads, and install the plug connector (15) on the leads.

(4) Position the grease seals (14) on the shaft of the armature (22) and install the pin (13).

(5) Position the blower wheel (12) on the armature shaft; secure with a setscrew (11).

(6) Position the worm gear (10) on the armature shaft; secure with a screw (8) and lockwasher (9).

(7) Position the left spacer plate (7) and the right spacer plate (6) on the motor;

secure with the four machine screws (4) and lockwashers (5).

(8) Replace the motor as described in paragraph 168*b*.

170. Disassembly and Reassembly of Series-governed Motor

(fig. 210)

a. Disassembly.

(1) Remove the series governed motor from the page printer as described in paragraph 168*a*.

(2) Remove the machine screw (5) and lockwasher (6) that hold the worm gear (7) to the armature shaft; remove the worm gear.

(3) Remove the pin (8) from the motor armature shaft; remove the grease seals (9 and 10) from the motor armature shaft.

(4) Unsolder the cable leads to the plug connector (11); remove the plug connector.

(5) Remove the setscrew (12) that holds the motor governor target (13) to the shaft of the motor speed governor base (37); remove the motor governor target.

(6) Remove the two machine screws (14) and lockwashers (15) that hold the motor governor cover (16) to the series-governed motor (38); remove the motor-governor cover.

(7) Remove the two setscrews (17) that hold the motor speed governor base (37) to the motor armature shaft; remove the assembled motor governor.

(8) Remove the spring (18) and the governor worm (19) from the motor governor.

(9) Remove the electrical contact brush (20) from the motor governor.

(10) Remove the two electrical contact brushes (21) from the series-governed motor (38).

b. Reassembly. Check the motor governor electrical contact brushes. Clean them if they are dirty or glazed; replace them if they are worn, chipped, or saturated with oil.

(1) Position the two electrical contact brushes (21, fig. 210) in the series-governed motor (38).

(2) Install the electrical contact brush (20) in the motor speed governor base (37).

(3) Install the governor worm (19) and spring (18) in the motor speed governor base (37).

(4) Position the assembled motor governor on the motor armature shaft; secure with the two setscrews (17).

(5) Position the motor-governor cover (16) on the series-governed motor; secure with two machine screws (14) and lockwashers (15).

(6) Position the motor-governor target (13) on the shaft of the motor speed governor base (37); secure with a setscrew (12).

(7) Solder the leads of the cable to the plug connector (11).

(8) Install the grease seals (10 and 9) on the motor armature shaft; install the pin (8) in the motor armature shaft.

(9) Position the worm gear (7) on the motor armature shaft; secure with a machine screw (5) and lockwasher (6).

(10) Install the series-governed motor on the page printer as described in paragraph 168*b*.

(11) Adjust the series-governed motor as directed in paragraph 528.

171. Replacement of Series-governed Motor Brushes

The contact surfaces of the motor brushes must be curved to fit the commutator. Shape the surface of the brush, when necessary, as follows:

a. Wrap a piece of No. 0000 sandpaper around the armature and under the brush holder, with the abrasive side out. Allow the normal pressure of the brush spring to press the brushes against the sandpaper.

b. Turn the armature, around which the sandpaper is wrapped, back and forth by hand until the brush has the same curvature as the commutator. The last turning of the armature should be in the direction of normal motor rotation.

c. Remove the brush and bevel the edges slightly with sandpaper.

d. Wipe the brush with a piece of cloth slightly moistened with cleaning compound.

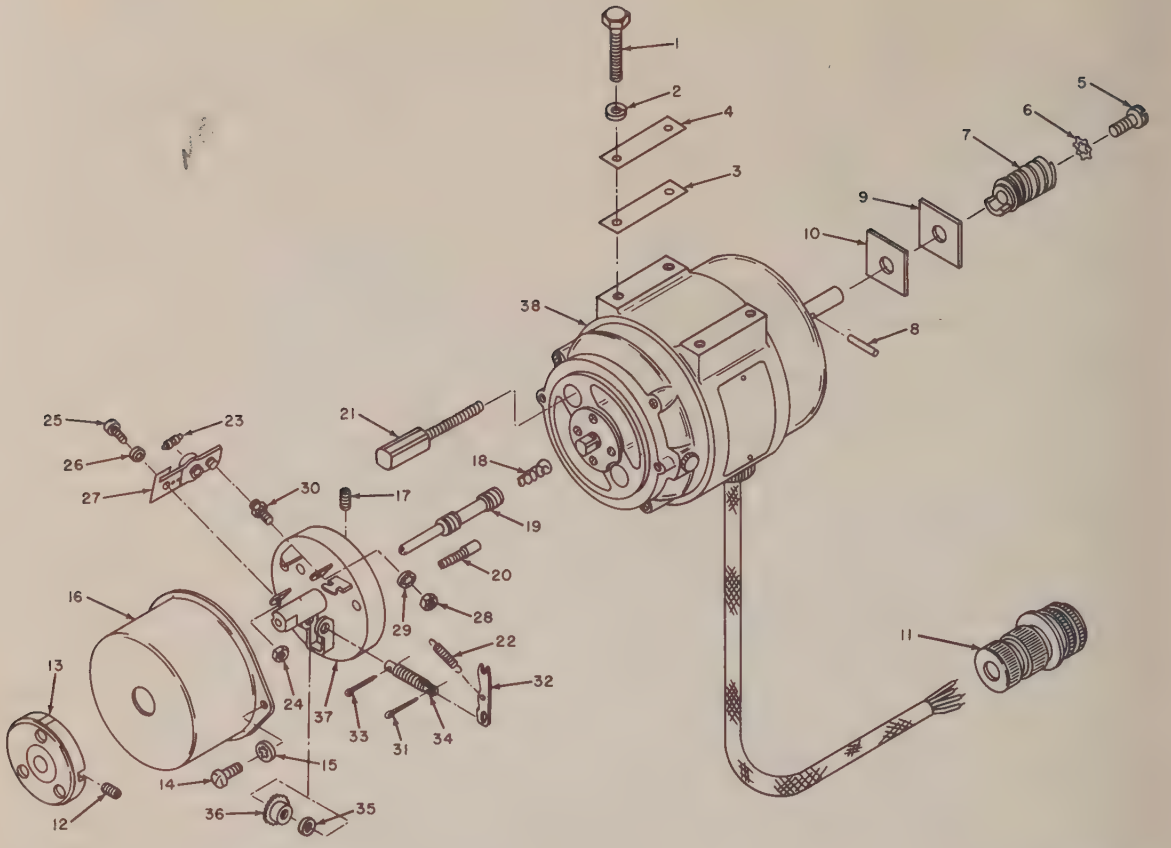
e. Clean the brush holder with a cloth moistened with Cleaning Compound and wrapped around a small screwdriver blade or similarly shaped tool.

f. Reinsert the brushes in their holders.

172. Repair of Motor Commutator

a. Cleaning Commutator.

(1) If there is excessive sparking under the motor brushes when the motor is running, disassemble the motor and clean the commutator with a cloth dampened with



1 Machine screw, 10017
2 Lockwasher, 10405
3 Shim, 51509
4 Shim, 51510
5 Machine screw, 50207
6 Lockwasher, 10406
7 Worm gear, 50350
8 Pin, 50359
9 Grease seal, 50949
10 Grease seal, 50949
11 Plug connector, 53512A
12 Setscrew, 10204
13 Motor governor target, 50303A
14 Machine screw, 10321
15 Lockwasher, 10412
16 Motor governor cover, 50311
17 Setscrew, 10203
18 Spring, 51855
19 Governor worm, 56555A
20 Electrical contact brush, 51154
21 Electrical contact brush, 51543
22 Spring, 50334
23 Grooved pin, 50302
24 Self-locking hexagonal nut, 10500
25 Machine screw, 10001
26 Lockwasher, 10403
27 Electrical contacts 50281A and 50293
28 Plain hexagonal nut, 10507
29 Lockwasher, 10404
30 Electrical contact, 50338
31 Cotter pin, 10800
32 Governor adjustment lever, 50301
33 Cotter pin, 10800
34 Governor adjustment screw, 50299
35 Flat washer, 50148
36 Motor governor adjustment gear, 50278A
37 Motor speed governor base, 51249A
38 Series-governed motor, 51861A

Figure 210. Series-governed motor, exploded view.

Cleaning Compound. Reassemble and run the motor.

(2) If there is still excessive sparking, remove the armature from the motor and clean the commutator lightly with No. 0000 sandpaper.

Caution: Do not use emery cloth. Wrap the sandpaper around the armature and turn the armature in a lathe or between fixed centers, holding the sandpaper lightly by hand. The copper commutator segments frequently become dark because particles of carbon from the brushes become embedded in the copper commutator segments. This is a desirable condition. Do not polish merely to remove the discoloration.

b. Undercutting Mica Separators Between Commutator Segments. Excessive sparking between the commutator and the motor brushes results when the copper segments of the commutator are worn down below the level of the mica separators.

To insure adequate contact between the copper segments and the brushes, the top of the mica separators should be cut down 1/64- to 1/32-inch below the surface of the copper segments. Repeat for all segments.

Caution: After the mica has been undercut between all segments, check to see that no particles of metal remain in the slots. Such metal particles may short the commutator segments and burn out the windings when the motor is started.

c. Resurfacing Motor Commutator. The commutator may be resurfaced as follows by experienced personnel, but only with the specific approval of supervisory personnel responsible for the equipment:

(1) Mount the motor armature on a lathe so that the shaft does not run out of line more than .0005 inch. Approximately .125 inch on the edge nearest the windings should be allowed to remain its original diameter. Extreme care should be exercised to avoid damaging the coils at a point where they are soldered to the commutator. Do not remove more metal than necessary.

(2) Polish the commutator with a strip of fine sandpaper (No. 000 or No. 0000) held in flat contact with the commutator as it revolves in the lathe.

Caution: Do not attempt to smooth a rough commutator with sandpaper unless a lathe is available. Do not use emery cloth or carborundum paper because particles of these abrasives may cause trouble in electrical circuits.

(3) After the commutator is resurfaced, check to see that the surfaces of the mica separators are below the surfaces of the copper segments of the commutator as described in *b*(2) above. If these requirements are not met, undercut the mica segments as described above.

173. Disassembly and Reassembly of Motor Governor

(fig. 210)

a. Disassembly.

(1) Remove the motor governor from the series-governed motor as described in paragraph 170*a*(5) through (9).

(2) Remove the spring (22) from the governor adjustment lever (32) and from the grooved pin (23). Remove the grooved pin.

(3) Remove the self-locking hexagonal nut (24), machine screw (25), and lockwasher (26) that hold the electrical contact (27) to the motor speed governor base (37); remove the electrical contact.

(4) Remove the plain hexagonal nut (28) and lockwasher (29) that hold the electrical contact (30) to the motor speed governor base (37); remove the electrical contact.

(5) Remove the cotter pin (31) that holds the governor adjustment lever (32) to the governor adjustment screw (34); remove the governor adjustment lever.

(6) Remove the cotter pin (33) from the opposite end of the governor adjustment screw (34); turn out the governor adjustment screw from the mounting on the motor speed governor base (37); catch the flat washer (35) and the motor governor adjustment gear (36) as they fall from the motor speed governor base.

b. Reassembly. If necessary, clean or burnish the governor contact points before reassembly. Remove any built up or pitted portions of the contacts with a contact file. Do not remove any more metal than is necessary.

(1) Position the motor governor adjustment gear (36) and flat washer (35) on the motor speed governor base; secure by turning in the governor adjustment screw (34). Install the cotter pin (33) on the end of the governor adjustment screw.

(2) Position the governor adjustment lever (32) on the end of the governor adjustment screws (34); secure with a cotter pin (31).

(3) Position the electrical contact (30) on the motor speed governor base (37); secure with a plain hexagonal nut (28) and lockwasher (29).

(4) Position the electrical contact (27) on the motor speed governor base (37); secure with a machine screw (25), lockwasher (26), and self-locking hexagonal nut (24).

(5) Position the grooved pin (23) on the electrical contact (27); install the spring (22) on the grooved pin and on the governor adjustment lever (32).

(6) Install the motor governor on the series-governed motor as described in paragraph 170*b*(1) through (6).

(7) Adjust the speed of the series-governed motor as described in paragraph 22.

174. Removal and Replacement of Platen Assembly

a. Removal.

(1) Remove the two machine screws (1, fig. 211) flat washers (2) and lockwashers (3) that hold the bracket link (12) to the page printer frame.

(2) Remove the two retainer rings that hold the connecting and carriage shift links to the studs on the platen assembly.

(3) Remove the two setscrews (1, fig. 212) that hold the eccentric pivots (4) to the page printer frame; remove the assembled eccentric pivots, and plain hexagonal nuts (2), and spacing collars (3). Remove the two hexagonal nuts and the spacing collar from each of the eccentric pivots.

(4) Lift the platen assembly from the page printer frame.

b. Replacement.

(1) Position the platen assembly on the page printer frame.

(2) Install the spacing collar (3, fig. 212) and the two plain hexagonal nuts (2) on each of the eccentric pivots (4). Position the pivots in the hole in the frame casting so that the eccentric stud on the end of the pivot engages the bearing in the platen support frame (30); secure the eccentric pivots with the two setscrews (1).

(3) Position the connecting and the carriage shift links on the studs on the platen assembly; secure with the two retainer rings.

(4) Aline the holes in the bracket link (12, fig. 211) with the tapped holes in the page printer frame; secure the bracket link to the frame with the two machine screws (1), flat washers (2), and lockwashers (3).

175. Disassembly and Reassembly of Platen Assembly

a. Disassembly.

(1) Remove the platen assembly from the page printer as described in paragraph 174*a*.

(2) Remove the machine screw (5, fig. 212) and lockwasher (6), that hold the platen latching arm (7) to the platen support frame (30); remove the platen latching arm.

(3) Remove the platen locking stud (8) from the platen support frame (30).

(4) Remove the retainer ring (9) from the mounting stud on the platen blocking arm (13).

(5) Remove the self-locking hexagonal nut (10), machine screw (11) and flat washer (12) then secure platen blocking arm (13) to the platen blocking arm bracket (16); remove the platen blocking arm.

(6) Remove the two machine screws (14) and lockwashers (15) that attach the platen blocking arm bracket (16) to the platen support frame (30); remove the platen blocking arm bracket.

(7) Remove the machine screw (17) and lockwasher (18) that hold the platen shift arm (19) on the platen support frame (30); remove the platen shift arm.

(8) Remove the two setscrews (20) that hold the detent wheel (24) to the platen shaft (22).

(9) Remove the two setscrews (21) that hold the shaft collar (25) on the platen shaft (22).

(10) Remove the setscrews that secure the platen to the platen shaft (22); remove the platen roll shaft. Remove the single-double line feed lever (23), detent wheel (24), shaft collar (25), platen, the platen trough, and the assembled line feed lever (29) and line feed pawl (28).

(11) Remove one end of the line feed pawl spring (26) from the hole in the line feed pawl (28) and the other end from the hole in the line feed lever (29); remove the spring.

(12) Remove the retainer ring (27) from the pivot stud on the line feed lever (29); remove the line feed pawl (28) from the line feed lever.

b. Reassembly.

(1) Position the line feed pawl (28) on the pivot stud on the line feed lever (29); hold the line feed lever on the pivot stud with the retainer ring (27).

(2) Hook one end of the line feed pawl spring (26) in the line feed pawl (28) and the other end in the line feed lever (29).

(3) Position the line feed lever (29), shaft collar (25), detent wheel (24), single-

double line feed lever (23), platen, and platen trough on the platen shaft (22) as the shaft is inserted through the bushings in the platen support frame (30).

(4) Hold the shaft collar (25) on the platen shaft with the two setscrews (21).

(5) Hold the detent wheel (24) on the platen shaft with the two setscrews (20).

(6) Position the platen shift arm (19) on the platen support frame (30); attach with a lockwasher (18) and machine screw (17).

(7) Position the platen blocking arm bracket (16) on the platen support frame (30); attach with the two lockwashers (15) and machine screws (14).

(8) Position the pivot stud of the platen blocking arm (13) in the platen blocking arm bracket (16); attach with a lockwasher (12), machine screw (11), and self-locking hexagonal nut (10).

(9) Hold the pivot stud of the platen blocking arm (13) in place with a retainer ring (9).

(10) Install the platen locking stud (8) in the platen support frame (30).

(11) Position the platen latching arm (7) on the platen support frame (30); attach with a lockwasher (6) and machine screw (5).

(12) Adjust the platen as explained in paragraphs 358 through 364.

(13) Replace the platen assembly as described in paragraph 174*b*.

176. Disassembly and Reassembly of Platen Trough

(fig. 211)

a. Disassembly.

(1) Remove the platen trough from the platen frame as described in paragraph 175*a*.

(2) Remove the retainer rings (4 and 5) that hold the connecting link (6) to the platen trough (46) and to the bracket link (12).

(3) Remove the platen lever latch spring (7) from the spring post on the platen trough and from the platen lever latch (8); remove the platen lever latch.

(4) Remove the retainer rings (9 and 10) that hold the connecting link (11) to the platen trough (46) and to the bracket link (12); remove the connecting link and the bracket link.

(5) Remove the platen detent spacing spring (13) from the platen spacing detent (15) and from the spring post on the platen trough (46).

(6) Remove the flat washer (14), platen spacing detent (15), and flat washer (16) from the platen trough.

(7) Remove the platen detent spring (17) from the line spacing detent (19) and from the spring post on the platen trough (46).

(8) Remove the retainer ring (18) that holds the line spacing detent (19) to the platen detent eccentric stud (22); remove the line spacing detent.

(9) Remove the plain round nut (20) and lockwasher (21) that hold the platen detent eccentric stud (22) to the platen trough (46); remove the platen detent eccentric stud.

(10) Remove the setscrew (23) that holds the pressure roller lever (24) to the platen pressure roller operating shaft (30); remove the pressure roller lever.

(11) Remove the pressure roller operating shaft screw (25) that holds the platen pressure roller operating shaft (30) to the platen trough; slide the platen pressure roller operating shaft to the left to remove it from the platen trough (46).

(12) Remove the two retainer rings (26 and 27) from the platen pressure roller shaft (28); remove the platen pressure roller shaft and the platen pressure roller (29) from the platen pressure roller operating shaft (30).

(13) Remove the two paper guide springs (31) from the paper guides (42 and 38) and from the platen trough (46).

(14) Remove the pivot screw (32) that holds the paper guide shaft (37) to the platen trough (46).

(15) Remove the two setscrews (33 and 34) that hold the paper guides (38 and 42) to the paper guide shaft (37).

(16) Remove the three stripper springs (36) from the six paper strippers (40 and 41).

(17) Remove the four retainer rings (35) that position the six paper strippers (40) on the paper guide shaft (37); remove the paper guide shaft, and catch the paper guide (38), three sleeves (39), six paper strippers (40 and 41), and paper guide (42), as they fall from the shaft.

(18) Remove the hinge pin (43) that holds the paper trough guide (45) to the platen

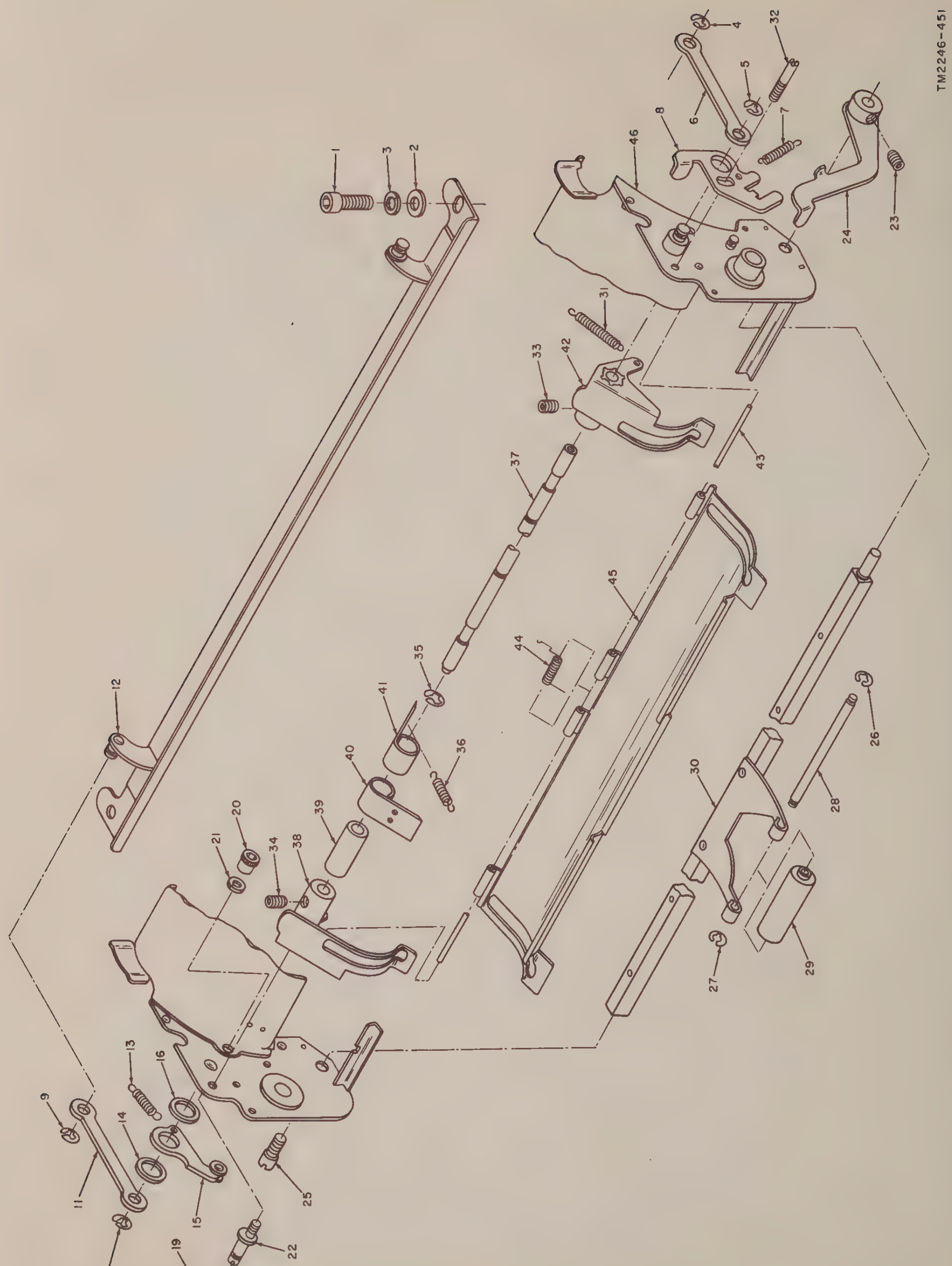


Figure 211. Platen trough assembly, exploded view.

1 Machine screw, 10024
2 Flat washer, 10464
3 Lockwasher, 10431
4 Retainer ring, 10949
5 Retainer ring, 10949
6 Connecting link, 50215
7 Platen lever latch spring, 53149
8 Platen lever latch, 54951
9 Retainer ring, 10949
10 Retainer ring, 10949
11 Connecting link, 50215
12 Bracket link, 53138A
13 Platen spacing detent spring, 51851
14 Flat washer, 51768
15 Platen spacing detent, 53202A
16 Flat washer, 51768
17 Platen detent spring, 51851
18 Retainer ring, 10960
19 Line spacing detent, 50108A
20 Plain round nut, 10537
21 Lockwasher, 10429
22 Platen detent eccentric stud, 52931
23 Setscrew, 10201
24 Pressure roller lever, 54954A
25 Pressure roller operating shaft screw, 50238
26 Retainer ring, 51099
27 Retainer ring, 51099
28 Platen pressure roller shaft, 54968
29 Platen pressure roller, 50161A
30 Platen pressure roller operating shaft, 55530A
31 Paper guide spring, 52169
32 Pivot screw, 55139
33 Setscrew, 10201
34 Setscrew, 10201
35 Retainer ring, 10949
36 Stripper spring, 55143
37 Paper guide shaft, 55152
38 Paper guide, 55144A
39 Sleeve, 55041
40 Paper stripper, 55151
41 Paper stripper, 55151
42 Paper guide, 55141A
43 Hinge pin, 55146
44 Platen trough spring, 54967
45 Paper trough guide, 54962
46 Platen trough, 55136A

Figure 211—Continued.

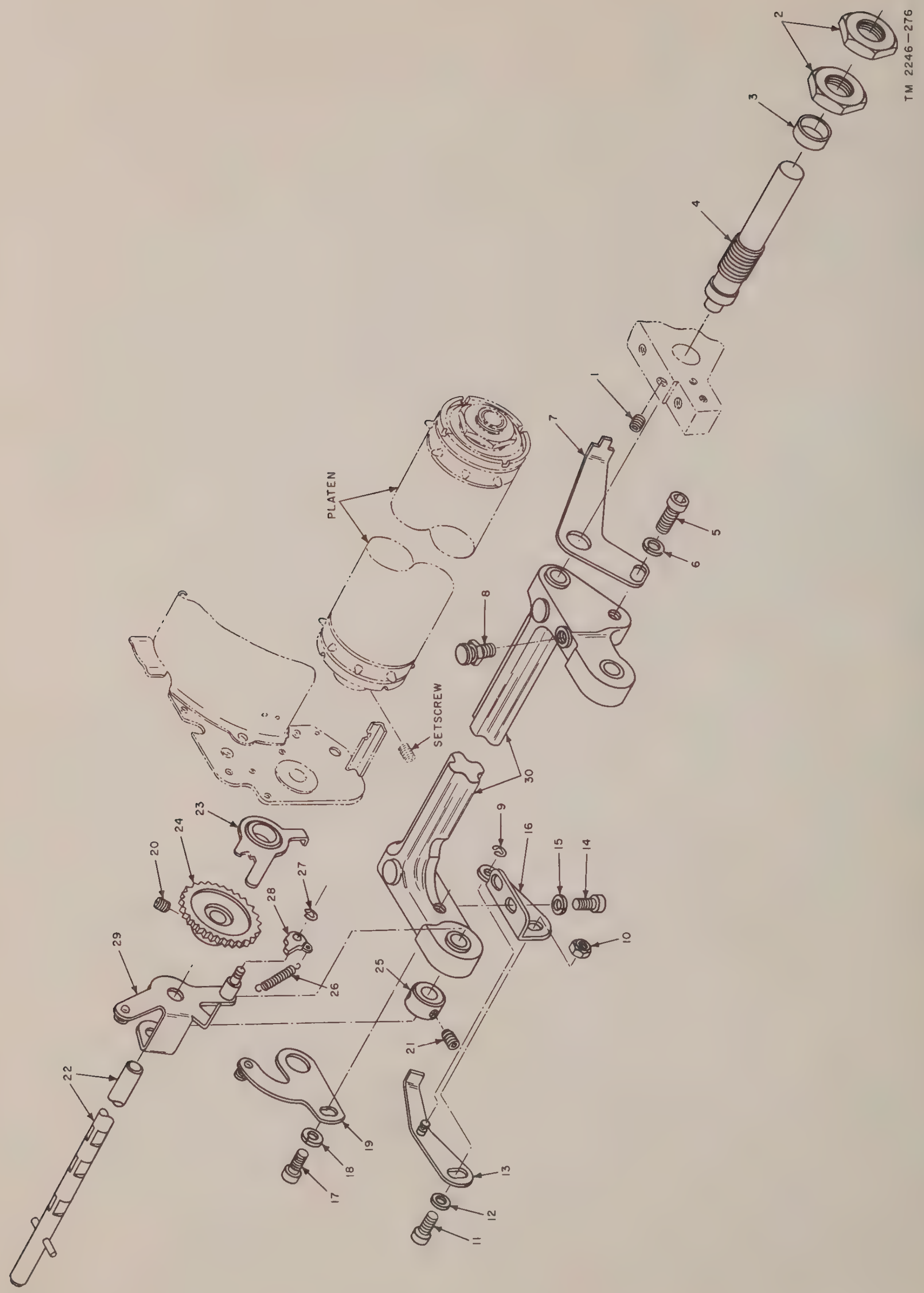


Figure 212. Platen frame assembly, exploded view.

1 Set screw, 10211
2 Plain hexagonal nut, 10524
3 Spacing collar, 55174
4 Eccentric pivot, 55173
5 Machine screw, 10015
6 Lockwasher, 10431
7 Platen latching arm, 50214
8 Platen locking stud, 50762
9 Retainer ring, 10969
10 Self-locking hexagonal nut, 10501
11 Machine screw, 10008
12 Flat washer, 10467
13 Platen blocking arm, 53095A
14 Machine screw, 10008
15 Lockwasher, 10430
16 Platen blocking arm bracket, 52307
17 Machine screw, 10005
18 Lockwasher, 10431
19 Platen shift arm, 53134A
20 Setscrew, 10209
21 Setscrew, 10209
22 Platen shaft, 54955
23 Single-double line feed lever, 51762A
24 Detent wheel, 52807
25 Shaft collar, 50209
26 Line feed pawl spring, 50333
27 Retainer ring, 10969
28 Line feed pawl, 50165
29 Line feed lever, 53137A
30 Platen support frame, 53305A

Figure 212—Continued.

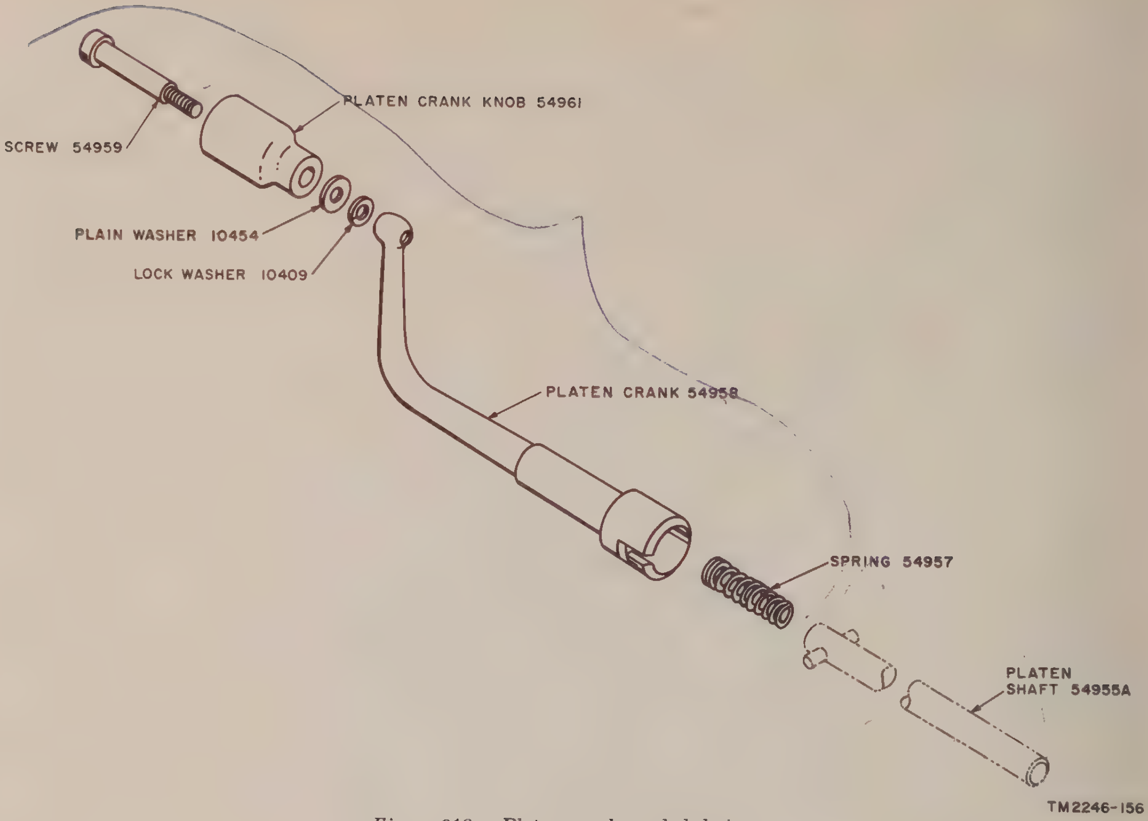


Figure 213. Platen crank, exploded view.

trough (46); remove the platen trough spring (44) and the paper trough guide.

b. Reassembly.

(1) Position the paper trough guide (45) on the platen trough (46); insert the hinge pin (43) far enough to install the platen trough spring (44); install the spring and insert the hinge pin the rest of the way.

(2) Position the paper guide (42), six paper strippers (41 and 40), three sleeves (39), and paper guide (38) on the paper guide shaft (37). Install the four retainer rings (35) to hold the paper strippers (40 and 41) in position.

(3) Install the three stripper springs (36) on the paper strippers (40 and 41).

(4) Position the paper guides (38 and 42) on the paper guide shaft (37); secure with the two setscrews (33 and 34).

(5) Position the assembled paper guide shaft and paper guides on the platen trough (46); secure with a pivot screw (32).

(6) Install the two paper guide springs (31) on the paper guides (38 and 42) and on the platen trough (46).

(7) Position the platen pressure roller (29) between the arms of the platen pressure roller operating shaft (30); insert the platen pressure roller shaft (28) through the arms and roller. Secure with two retainer rings (26 and 27).

(8) Position the platen pressure roller operating shaft (30) on the platen trough (46); secure by installing the pressure roller operating shaft screw (25).

(9) Position the pressure roller lever (24) on the platen pressure roller operating shaft (30); secure with a setscrew (23).

(10) Position the platen detent eccentric stud (22) on the platen trough (46); secure with a lockwasher (21) and plain round nut (20).

(11) Position the line spacing detent (19) on the platen detent eccentric stud (22); secure with a retainer ring (18).

(12) Install the platen detent spring (17) on the line spacing detent (19) and on the spring post on the platen trough (46).

(13) Position a flat washer (16), platen spacing detent (15), and flat washer (14), on the stud on the platen trough (46).

(14) Install the platen spacing detent spring (13) on the platen spacing detent (15) and on the spring post on the platen trough (46).

(15) Position the connecting link (11) on the bracket link (12) and on the stud on the platen trough; secure with the two retainer rings (10 and 9).

(16) Position the platen lever latch (8) on the stud on the platen trough (46); install the the platen lever latch spring (7) on the platen lever latch and on the platen trough.

(17) Position the connecting link (6) on the bracket link (12) and on the stud on the right side of the platen trough (46); secure with the two retainer rings (5 and 4).

(18) Adjust the platen trough as instructed in paragraphs 353, 354, 356, 357, 361, 362, 364, and 365.

(19) Install the platen trough on the platen frame as described in paragraph 175*b*.

177. Disassembly and Reassembly of Platen Crank

(fig. 213)

a. Disassembly.

(1) Remove platen crank 54958 from platen shaft 54955A at the bayonet type connection by pushing the crank in and turning it clockwise; remove spring 54957.

(2) Remove screw 54959 that holds platen crank knob 54961 on platen crank 54958; remove platen crank knob 54961, plain washer 10454, and lockwasher 10409.

b. Reassembly.

(1) Position lockwasher 10409, plain washer 10454, and platen crank knob 54961 on platen crank 54958; attach to platen crank 54958 with screw 54959.

(2) Fasten platen crank 54958 on platen shaft 54955A at the bayonet type connection by placing spring 54957 in the bayonet socket of platen crank 54958, pushing the bayonet socket on the pin on the platen shaft and twisting the platen crank counterclockwise.

178. Disassembly and Reassembly of Platen

(fig. 214)

a. Disassembly.

(1) Remove the platen from the platen assembly as described in paragraph 175*a*(1) through (10).

(2) Remove the plain hexagonal nut (2) from the shaft (3); remove the pinwheel body (13) and the platen roller (4) from the pinwheel body (21).

(3) Remove the parts from the pinwheel body (13) by removing the retainer ring (5), flat washer (6), sprocket friction plate (7), sprocket cam plate (8), inside guide (9), sprocket feed pin (10), and locking pin (12) from the pinwheel body (13).

(4) Remove the parts from the pinwheel body (21) by removing the retainer ring (14), flat washer (15), sprocket friction ~~plate (16),~~ sprocket cam plate (17), inside guide (18), sprocket feed pin (19), and ~~locking pin (20).~~

b. Reassembly.

(1) Assemble the pinwheel body (21) by inserting the nine sprocket feed pins (19) in the holes in the pinwheel body; position the inside guide (18) on the pins in the side of the sprocket feed pins.

(2) Attach the inside guide (18) to the pinwheel body (21) with the dowel pin. The head of the dowel pin should be flush with or .005 inch below the outer edge of the pinwheel body (21).

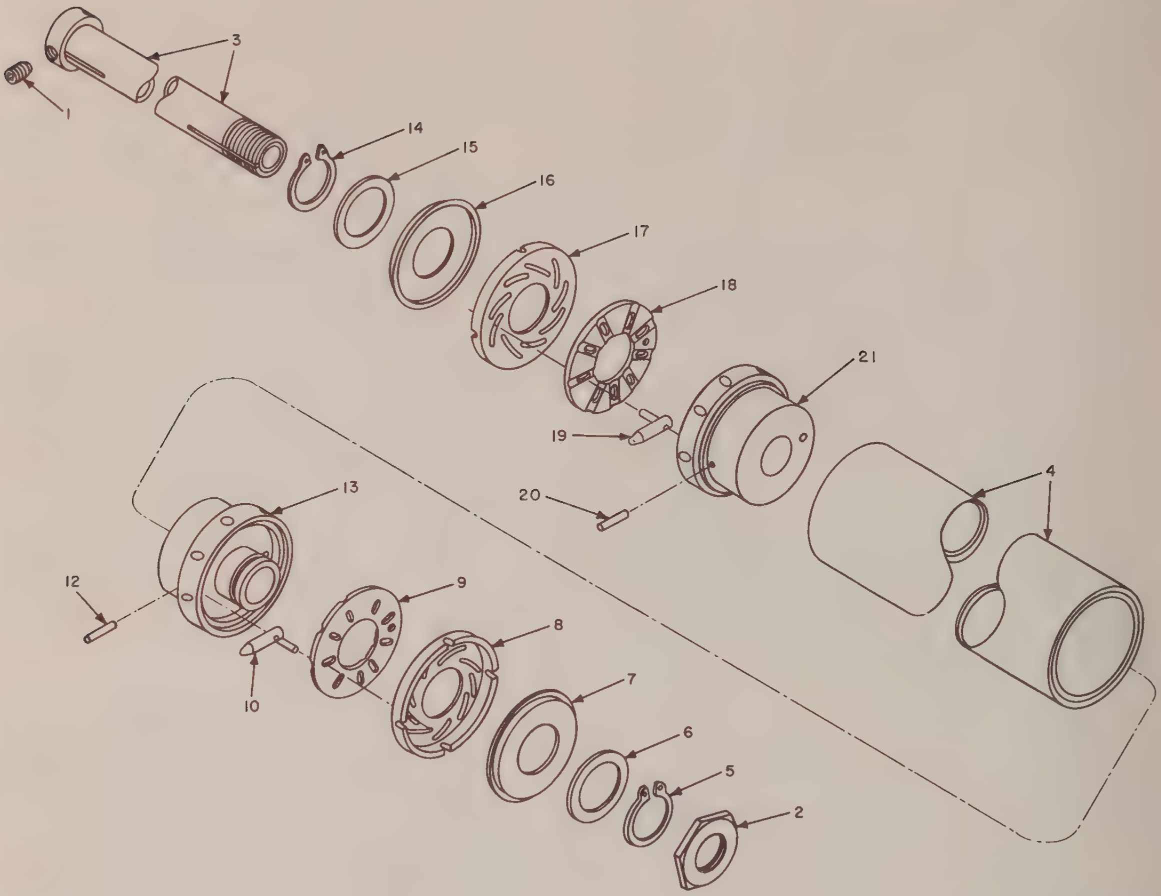
(3) Position the sprocket cam plate (17) on in the pins in the side of the sprocket feed pins (19).

(4) Place the sprocket friction plate (16) and the flat washer (15) on the sprocket cam plate; hold the assembled parts in place in the pinwheel body (21) with the retainer ring (14).

(5) Assemble the parts in the pinwheel body (13) in the same manner as for the pinwheel body (21).

(6) Slide the assembled pinwheel body (21) on the shaft (3); position the hole in the pinwheel body over the slot in the shaft and bottom the locking pin (20) in the slot in the shaft.

(7) Slide the platen roller (4) over the assembled pinwheel body (21) and up against the shoulder.



TM 2246–320

1 Setscrew, 10209
2 Plain hexagonal nut, 52806
3 Shaft, 52755A
4 Platen roller, 55079A
5 Retainer ring, 11046
6 Flat washer, 55169
7 Sprocket friction plate, 55160
8 Sprocket cam plate, 55158
9 Inside guide
10 Sprocket feed pin, 55170A
12 Locking pin, 55161
13 Pinwheel body, 55180A (includes items 9, 10, and 12)
14 Retainer ring, 11046
15 Flat washer, 55169
16 Sprocket friction plate, 55160
17 Sprocket cam plate, 55158
18 Inside guide
19 Sprocket feed pin, 55170
20 Locking pin, 55161
21 Pinwheel body, 55180A (includes items 18, 19, and 20)

Figure 214. Platen, exploded view.

(8) Slide the assembled pinwheel body (13) over the threaded end of the shaft (3); insert the locking pin (12) through the pinwheel body (13) and into the slot in the shaft. Hold the platen tube with the slot up and slide the pinwheel body into the platen roller with the locking pin (12) bottomed in the slot.

(9) Hold the platen together with the plain hexagonal nut (2) drawn up on threads of the platen shaft.

(10) Adjust the platen as described in paragraph 355.

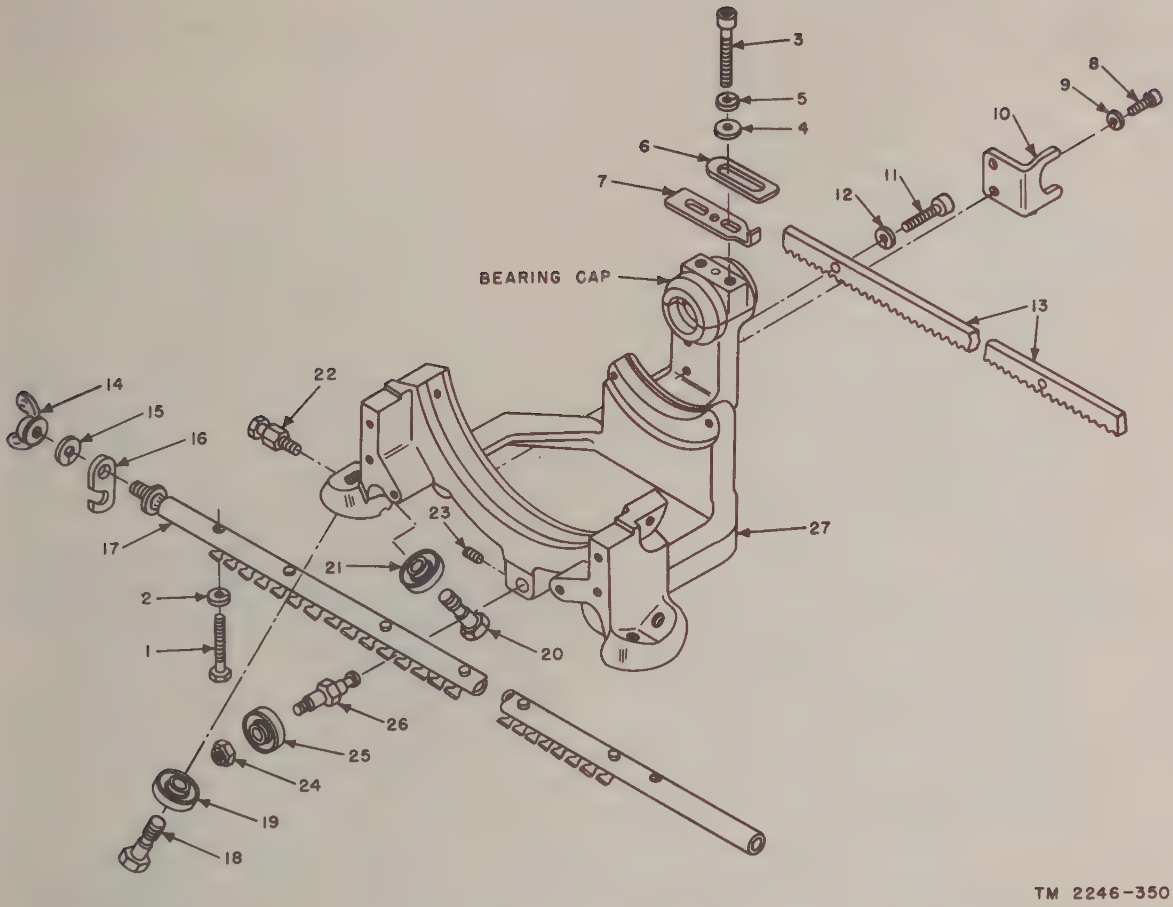
(11) Replace the platen in the platen assembly as described in paragraph 175*b*(3) through (12).

179. Removal and Replacement of Carriage
(fig. 215)

a Removal.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Move the carriage to the left margin stop and mark the two teeth on the fiber carriage rack driving gear that engage the last tooth on the carriage feed and return driving rack.



1	Machine screw, 10319
2	Lockwasher, 10430
3	Machine screw, 10013
4	Flat washer, 10467
5	Lockwasher, 10430
6	Right-hand margin trip plate, 52257
7	Left-hand margin trip plate, 52253
8	Machine screw, 10004
9	Lockwasher, 10429
10	Rear support bracket, 50571
11	Machine screw, 10011
12	Lockwasher, 10430
13	Carriage feed and return driving rack, 50592
14	Plain wingnut, 10508
15	Lockwasher, 10431
16	Platen lockup arm, 50598 (includes items 14, 15, and 16)
17	Guide rail, 50394
18	Cap screw, 50591
19	Ball bearing, 10752
20	Cap screw, 50591
21	Ball bearing, 10752
22	Carriage locking stud, 50594
23	Setscrew, 10204
24	Self-locking hexagonal nut, 10501
25	Ball bearing, 10752
26	Roller mounting stud, 50593
27	Carriage frame, 50545A

Figure 215. Carriage frame assembly, exploded view.

(3) Remove the machine screw (1) and lockwasher (2) that hold the guide rail (17) to the page printer frame on the left side and the similar screw and two lockwashers that hold the guide rail and the carriage return button bracket to the frame on the right side.

(4) Remove the two socket head machine screws (3), flat washers (4), and lockwashers (5) that hold the right-hand margin trip plate (6), left-hand margin trip plate (7), bearing cap, and the type selecting arm assembly to the carriage frame; remove the right-hand and left-hand margin trip plates, bearing cap, and type selecting arm.

(5) Remove the two machine screws (8) and lockwashers (9) that hold the carriage rear support bracket (10) to the carriage frame; slide the assembled support and sliding helical gear to the function side of the square shaft and remove the carriage rear support.

(6) Remove the carriage from the page printer frame by lifting it forward and upward.

b. Replacement

(1) Position the carriage on the page printer frame so that the two marked teeth on the fiber carriage rack driving gear mesh with the last tooth at the left of the carriage feed and return driving rack.

(2) Aline the carriage guide rail (17) with the two tapped holes in the page printer frame; secure with a machine screw (1) and lockwashers (2) on the left side and a similar screw and two lockwashers on the right side. Be sure to attach the carriage return button bracket between the two lockwashers on the right side.

Note. Be sure to place the ribbon lifter groove on the ribbon lifter rail located beneath the platen.

(3) Position the carriage rear support bracket (10) on the sliding helical gear so that the forks of the support are alined with the flatted portions of the gear mounting. Slide the sliding helical gear so that the holes in the support bracket are alined with the tapped holes in the carriage frame; secure with the two machine screws (8) and lockwashers (9).

Note. When properly alined with the flats on the gear mounting, the carriage rear support bracket will slide onto the mounting with only slight resistance. Do not force the support into place.

(4) Manually select the BLANK code group and turn the page printer motor by hand until the square shaft stops turning. Install the type selecting arm assembly so that the type selecting arm is in the blank code group position (the last notch in the right side of the guide plate).

(5) Position the bearing cap on the carriage frame; position the left-hand margin trip plate (7) and the right-hand margin trip plate (6) on the bearing cap; secure with the two machine screws (3), lockwashers (5), and flat washers (4).

(6) Adjust the carriage as described in paragraphs 333, 334, 335, and 378.

(7) Install the page printer on the printer base as described in paragraph 152*b*.

180. Disassembly and Reassembly of Type Selecting Arm

(fig 216)

a. Disassembly.

(1) Remove the type selecting arm (par. 179*a* (1)–(4)).

(2) Remove the plain hexagonal nut (4) and the round nut (5) from the threaded shaft of the type selecting arm (6); remove the type selecting arm from the type selector arm driven claw (15).

(3) Remove the plain hexagonal nut (7) and the internal tooth lockwasher (8) from the type selector arm driven claw.

(4) Remove the type selector arm driving gear (9) from the type selector arm driven claw (15); remove the machine key (10).

(5) Remove the ball bearing (11), flat washer (12), spacing collar (13), and the ball bearing (14) from the type selector arm driven claw (15).

b. Reassembly.

(1) Assemble the ball bearing (14), spacing collar (13), flat washer (12), and the ball bearing (11) on the type selector arm driven claw (15).

(2) Insert the machine key (10) in the keyway and install the type selector arm driving gear (9) on the type selector arm driven claw (15).

(3) Place the internal tooth lockwasher (8) on the type selector arm driven claw (15) and draw the plain hexagonal nut (7) tight against the internal tooth lockwasher.

(4) Insert the type selecting arm (6) in the type selector arm driven claw; install the round nut (5) and the plain hexagonal nut (4) on the type selecting arm.

(5) Install the type selecting arm (par. 179*b*) (4) through (6).

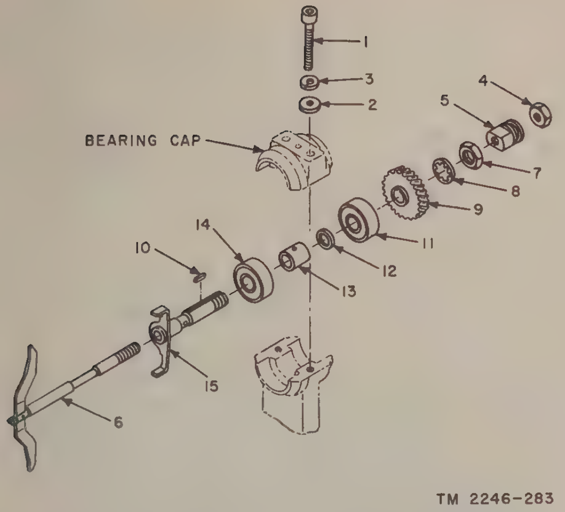
(6) Adjust the type selecting arm as directed in paragraphs 352, 374, 378, and 381.

181. Disassembly and Reassembly of Ribbon Guide and Vibrator

(fig. 217)

a. Disassembly.

(1) Unhook ribbon guide 55036 from ribbon vibrator bell crank assembly 55795A; remove ribbon guide 55036 from the ribbon guide mounting bracket.



1	Machine screw, 10013	8	Lockwasher, 10401
2	Flat washer, 10467	9	Type selector arm driving gear, 50556
3	Lockwasher, 10430	10	Machine key, 50558
4	Plain hexagonal nut, 10509	11	Ball bearing, 10757
5	Round nut, 50564	12	Flat washer, 50552
6	Type selecting arm, 50560A	13	Spacing collar, 50557
7	Plain hexagonal nut, 50559	14	Ball bearing, 10757
		15	Type selector arm driven claw, 50553A

Figure 216. Type selecting arm, exploded view.

(2) Remove two machine screws 10001 and lockwashers 10429 that attach ribbon vibrator lever and bracket assembly 55790A to the guide plate; remove the assembled ribbon lifter.

(3) Remove the ends of ribbon vibrator bell crank spring 51544 from ribbon vibrator lever and bracket assembly 55790A and from ribbon vibrator bell crank assembly 55795A.

(4) Remove two machine screws 10050, lockwashers 10432 and flat washers 50320 that attach ribbon vibrator bell crank assembly 55795A to ribbon vibrator lever and bracket assembly 55790A.

b. Reassembly.

(1) Position ribbon vibrator lever and bracket assembly 55790A on ribbon vibrator bell crank assembly 55795A; attach with two flat washers 50320, lockwashers 10432, and machine screws 10050.

(2) Hook the ends of ribbon vibrator bell crank spring 51544 in the spring holes in the tabs on ribbon vibrator bell crank assembly 55795A and vibrator lever and bracket assembly 55790A.

(3) Position ribbon vibrator lever and bracket assembly 55790A on the guide plate; attach with two lockwashers 10429 and machine screws 10001.

(4) Slide ribbon guide 55036 on the ribbon guide mounting bracket and hook the tab on ribbon guide 55036 to ribbon vibrator bell crank assembly 55795A.

(5) Adjust the ribbon guide and vibrator as directed in paragraph 376.

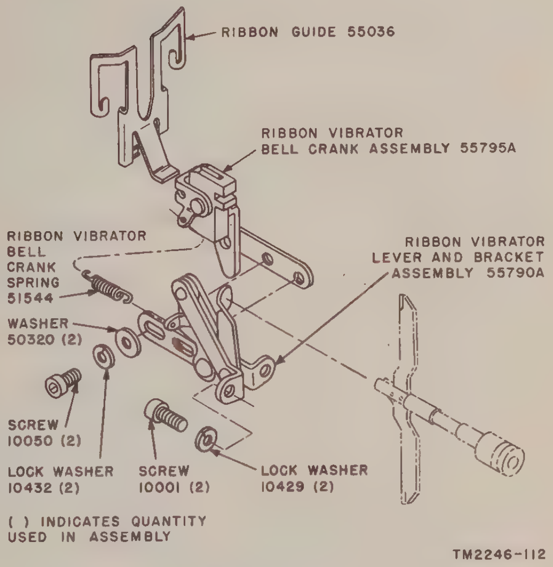

RIBBON GUIDE 55036
RIBBON VIBRATOR BELL CRANK ASSEMBLY 55795A
RIBBON VIBRATOR BELL CRANK SPRING 51544
RIBBON VIBRATOR LEVER AND BRACKET ASSEMBLY 55790A
WASHER 50320 (2)
SCREW 10050 (2)
LOCK WASHER 10432 (2)
SCREW 10001 (2)
LOCK WASHER 10429 (2)
( ) INDICATES QUANTITY USED IN ASSEMBLY
TM2246-112

Figure 217. Ribbon guide and vibrator assembly, exploded view.

182. Disassembly and Reassembly of Ribbon Feed Mechanism

(fig.218)

a. Disassembly.

(1) Remove the carriage from the page printer as described in paragraph 179*a*.

(2) Lift the locking latch and press in the ribbon sensing levers (20) to remove the printing ribbon spools (1) from the ribbon spool drive shafts (24); remove the printing ribbon spools and the printing ribbon from the machine.

(3) Remove the machine screws (2) and lockwashers (3) that hold the two ribbon drive mountings (29) to the carriage frame; remove the ribbon feed mechanism.

(4) Remove the four machine screws (4), lockwashers (5), and retainer plates (6)

that attach the type bar backstop cushion (7) to the ribbon drive mountings; remove the type bar backstop cushion.

(5) Remove the two self-locking hexagonal nuts (8) from the machine screws (9) that attach the ribbon drive subassembly (14) to the two ribbon drive mountings; lift the ribbon drive subassembly from the pins on the ribbon sensing levers (20) and from the two ribbon drive mountings.

(6) Remove the ribbon reversing detent spring (10) from the detent lever and frame of the ribbon drive subassembly (14).

(7) Remove the two machine screws (11) and lockwashers (12) that hold the ribbon reversing detent plate (13) on the ribbon drive assembly (14); remove the detent plate.

(8) Remove the two ribbon sensing lever springs (15) that are attached to the two ribbon sensing levers (20) and to the two ribbon drive mountings.

(9) Remove the two machine screws (16), flat washers (17), and lockwashers (18) that attach the two ribbon sensing levers to the posts on the two ribbon drive mountings; remove the ribbon sensing levers and slide off the two ribbon reversing cam followers (19).

(10) Remove the setscrews (21) that hold the ribbon spool driven shaft collars (22) on the ribbon spool drive shafts (24); remove the two ribbon spool driven shaft collars.

(11) Remove the setscrews (23) from the two shaft collars (27); remove the two ribbon spool drive shafts (24) from the ribbon drive mountings. Remove the two flat washers (25), spool friction springs (26), and shaft collars (27) from the shaft as the shafts are removed.

(12) Slide the two ribbon spool driving gears (28) from the two ribbon spool drive shafts.

b. Reassembly.

(1) Slide the two ribbon spool driving gears (28) on the two ribbon spool drive shafts (24).

(2) Insert the ends of the two ribbon spool drive shafts (24) through the bushings in the left and right ribbon drive mountings; reassemble the shaft collars (27), spool friction springs (26), and the flat washers (25) on the ribbon spool drive shafts.

(3) Push the ribbon spool drive shafts (24) all the way in; position the two ribbon spool driven shaft collars (22) on the two ribbon spool drive shafts and hold with the setscrews (21).

(4) Position the shaft collars (27) over the flats on the shaft and hold them in place with the setscrews (23).

(5) Position the two ribbon reversing cam followers (19) on the two ribbon sensing levers (20) and position the ribbon sensing levers on the posts on the two ribbon drive mountings. Hold the ribbon sensing levers with the two flat washers (17), lockwashers (18), and machine screws (16).

(6) Attach the two ribbon sensing lever springs (15) to the ribbon drive mountings and to the ribbon sensing levers (20).

(7) Position the ribbon reversing detent plate (13) on the ribbon drive subassembly (14), hold it in place with the two lockwashers (12) and machine screws (11).

(8) Hook the ribbon reverse detent spring (10) to the ribbon detent lever and frame of the ribbon drive subassembly (14).

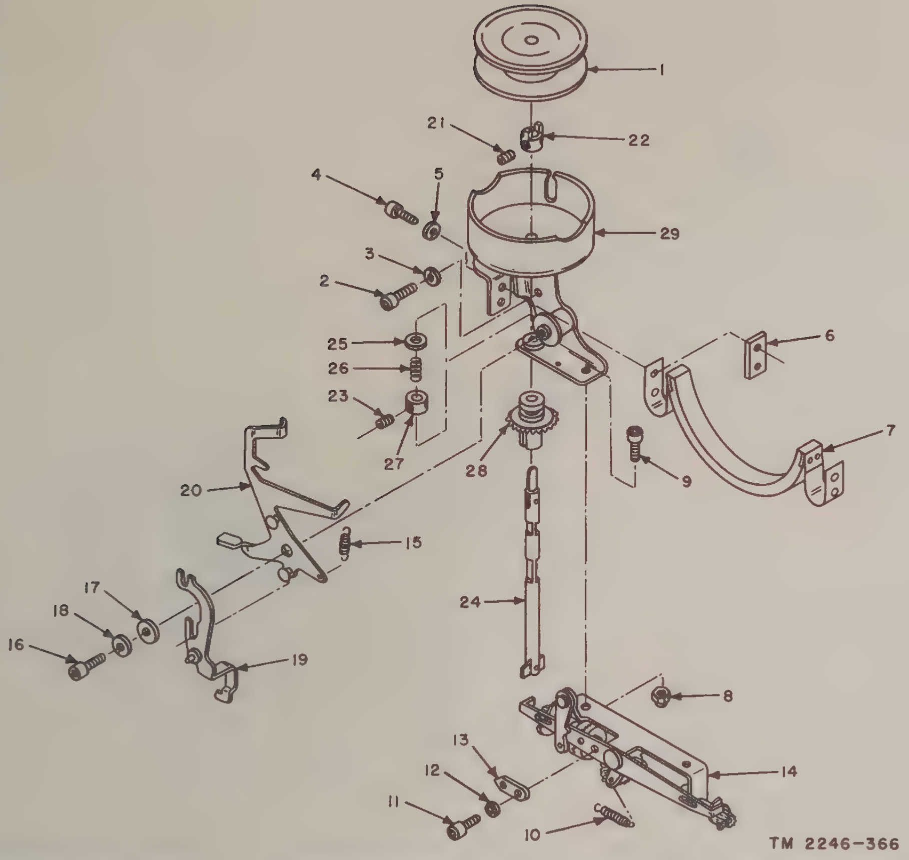
(9) Position the ribbon drive subassembly (14) on the pins on the two ribbon sensing levers (20) and on the two ribbon drive mountings; attach with the two machine screws (9) and self-locking nuts (8), but do not tighten securely.

(10) Position the type bar backstop cushion (7) on the two ribbon drive mountings; hold with the two retainer plates (6), four lockwashers (5), and four machine screws (4).

(11) Position the assembled ribbon feed mechanism on the frame of the carriage; hold in place with the lockwashers (3) and machine screws (2).

(12) Install the printing ribbon spools as instructed in paragraph 30*e*.

(13) Adjust the ribbon feed mechanism as described in paragraphs 377, 379, and 380.



1 Printing ribbon spool, 10900
2 Machine screw, 10004
3 Lockwasher, 10429
4 Machine screw, 10001
5 Lockwasher 10429
6 Retainer plate, 50434
7 Type bar backstop cushion, 50429A
8 Self-locking nut, 10500
9 Machine screws, 10003
10 Ribbon reversing detent spring, 50403
11 Machine screw 10002
12 Lockwasher, 10403
13 Ribbon reversing detent plate, 50393
14 Ribbon drive subassembly, 50400A (includes items 11, 12, and 13)
15 Ribbon sensing lever spring, 50447
16 Machine screw, 10003
17 Flat washer, 50414
18 Lockwasher, 10429
19 Ribbon reversing cam follower, 50423A (lh), 50424A (rh)
20 Ribbon sensing lever 55026A (lh), 55028A (rh)
21 Setscrew, 10201
22 Ribbon spool driven shaft collar, 50392
23 Setscrew, 10201
24 Ribbon spool drive shaft, 50435A
25 Flat washer, 50315
26 Spool friction spring, 53961
27 Shaft collar, 50391
28 Ribbon spool driving gear, 50448
29 Ribbon drive mounting, 50451A (lh), 50453A (rh)

Figure 218. Ribbon feed mechanism, exploded view.

183. Disassembly and Reassembly of Type Bar Group

(fig. 219)

a. Disassembly.

(1) Remove the ribbon feed mechanism as described in paragraph 182*a*(1) through (3).

(2) Remove the 26 springs (1) from the guide plate (18) and from the connecting bars (4).

(3) Push the hinge pin (2) out of the type bar segment (14).

(4) Remove the 26 type bars (3) and the 26 connecting bars (4) from the type bar segment (14) and from the mounting plate (17).

(5) Remove the two plain hexagonal nuts (5) and lockwashers (6) that lock the setscrews (7) in the carriage frame; remove the setscrews from the type bar segment (14) and the carriage frame. Remove the type bar segment from the carriage frame.

(6) Remove the type bar segment machine key (8) from the carriage frame.

(7) Remove the two machine screws (9) that hold the ribbon guide mounting bracket (10) in place on the type bar segment (14); remove the ribbon guide mounting bracket.

(8) Remove the four machine screws (11) that hold the stop plate (12) and type bar bumper plate shim (13) to the type bar segment (14); remove the type bar bumper stop plate and the type bar bumper plate shim.

(9) Remove the two machine screws (15) and lockwashers (16) that attach the mounting plate (17) and the guide plate (18) to the carriage frame; remove the guide plate and the mounting plate.

b. Reassembly.

(1) Position the guide plate (18) on the carriage frame and the mounting plate (17) on the guide plate; attach both to the frame with the two lockwashers (16) and machine screws (15).

(2) Position the type bar bumper plate shim (13) and the stop plate (12) on the type bar segment (14); attach the shim and plate to the type bar segment with the four machine screws (11).

(3) Position the ribbon guide mounting bracket (10) on the type bar segment (14); attach with the two machine screws (9).

(4) Position the type bar segment machine key (8) on the carriage frame.

(5) Position the type bar segment (14) on the type bar segment machine key (8); attach to the carriage frame with the two setscrews (7). Lock the setscrews in place with a lockwasher (6) and plain hexagonal nut (5).

(6) Position the 26 connecting bars (4) and the 26 type bars (3) in the type bar segment (14), with the connecting bars (4) against the guide plate (18). Numbers from 1 to 26 are stamped in both connecting bars and type bars. Install the bars in matched pairs with the No. 1 set on the left-side of the carriage. The bar sequence and reference numbers are given in the following chart

(7) Thread the hinge pin (2) in the type bar segment through the holes in the 26 type bars.

Type and Connecting Bar Sequence Chart

Number stamped in bar	Connecting bar reference No.	Type bar reference No.	Type bar letter	Code
1	50022	50054A	Z	"
2	50023	50055A	J	'
3	50024	50056A	X	/
4	50025	50057A	V	;
5	50026	50058A	B	?
6	50027	50059A	C	:
7	50028	50060A	P	0
8	50029	50061A	M	.
9	50030	50062A	F	!
10	50031	50063A	R	4
11	50032	50064A	O	9
12	50033	50065A	I	8
13	50034	50066A	T	5
14	50035	50067A	E	3
15	50036	50068A	A	—
16	50037	53260A	S	
17	50038	53280A	H	
18	50039	50071A	N	'
19	50040	50072A	L	)
20	50041	50073A	D	$
21	50042	50074A	U	7
22	50043	50075A	G	&
23	50044	50076A	Y	6
24	50045	50077A	W	2
25	50046	50078A	K	(
26	50047	50079A	Q	1

(8) Install the 26 springs (1) on the connecting bars (4) and on the mounting plate (17).

(9) Install the ribbon feed mechanism as described in paragraph 182*b*(11) and (12).

184. Disassembly and Reassembly of Carriage Frame

(fig. 215)

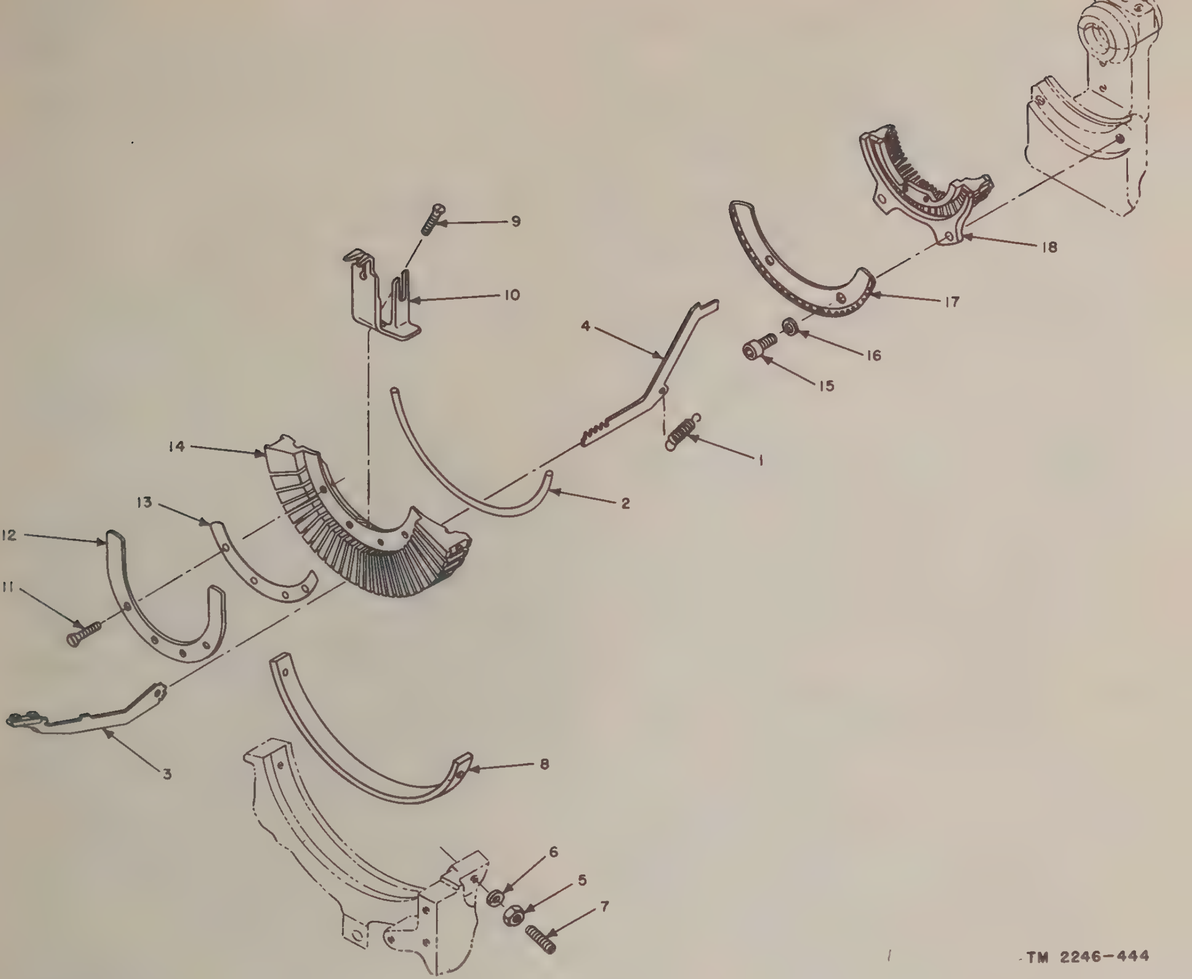
a. Disassembly.

(1) Remove the carriage from the page printer as described in paragraph 179*a*.

(2) Remove the two machine screws (11) and lockwashers (12) that hold the carriage feed and return driving rack (13) to the carriage frame (27); remove the carriage feed and return driving rack (13).

(3) Remove the plain wingnut (14), lockwasher (15), and platen lockup arm (16) from the threaded end of the guide rail (17); remove the guide rail from the rollers.

(4) Remove the two cap screws (18) that hold the ball bearings (19) in place on the carriage frame (27); remove the two ball bearings.



1	Spring, 50595
2	Hinge pin, 50572
3	Type bar (for part No. see sequence chart in paragraph 183*b*(6))
4	Connecting bar (for part number see sequence chart in paragraph 183*b*(6))
5	Plain hexagonal nut, 10509
6	Lockwasher, 10431
7	Setscrew, 10214
8	Machine key, 50550
9	Machine screw, 10306
10	Mounting bracket, 55147
11	Machine screw, 51132
12	Stop plate, 55791
13	Type bar bumper plate shim, 51244
14	Type bar segment, 50549
15	Machine screw, 10025
16	Lockwasher, 10430
17	Mounting plate, 50548
18	Guide plate, 50547

Figure 219. Type bar group, exploded view.

(5) Remove the two cap screws (20) that hold the ball bearings (21) on the carriage frame (27); remove the ball bearings.

(6) Remove the carriage locking stud (22) from the carriage frame (27).

(7) Remove the setscrew (23) that holds the roller mounting stud (26) in the carriage frame (27); remove the assembled roller stud and bearing (25).

(8) Remove the self-locking hexagonal nut (24) and the ball bearing (25) from the roller mounting stud (26).

b. Reassembly.

(1) Install the ball bearing (25) on the roller mounting stud (26); secure with a self-locking hexagonal nut (24).

(2) Insert the roller mounting stud in the carriage frame (27); hold in place with a setscrew (23).

(3) Install the carriage locking stud (22) in the carriage frame (27).

(4) Install the two ball bearings (21) on the two cap screws (20); install the assembled

cap screws and bearings in the carriage frame (27).

(5) Install the two ball bearings (19) on the two cap screws (18); install the assembled cap screws and bearings on the carriage frame (27).

(6) Slide the guide rail (17) into position between the five ball bearings, with the teeth engaging the gear on the ribbon drive mounting.

(7) Place the platen lockup arm (16) and lockwasher (15) on the threaded end of the guide rail (17); hold them with a plain wingnut (14).

(8) Position the carriage feed and return driving rack (13) on the carriage frame (27); attach with the two lockwashers (12) and machine screws (11).

(9) Install the type carriage on the page printer as described in paragraph 179*b*.

(10) Adjust the carriage as described in paragraphs 333, 334, 335, and 378.

185. Disassembly and Reassembly of Selector Magnet

(fig. 220)

a. Disassembly.

(1) Remove the two machine screws (1), flat washers (2), and lockwashers (3) that attach the selector magnet-bracket (44) to the frame of the page printer; remove the selector magnet assembly from the frame of the page printer.

(2) Remove the two cotter pins (4) that hold the cover (5) on the studs of the selector magnet (26); remove the cover and the two cover springs (6).

(3) Remove the two machine screws (7) and lockwashers (8) that attach the assembled potentiometer mounting bracket (11) to the selector-magnet bracket (44); remove the assembled potentiometer (16) and bracket.

(4) Remove the locking nut (9) and the plain hexagonal nut (10) from the threaded bushing of the potentiometer (16); remove the potentiometer mounting bracket (11), lockwasher (12), and flat washer (13) from the potentiometer.

(5) Unsolder the two electrical leads in the tubing (14) from the two terminal posts on the selector magnet (26) and from the two terminal lugs on the potentiometer (16); tag the leads. Remove the tubing from the electrical cable assembly. Remove the two pieces of insulating tubing (15) from the electrical leads at the potentiometer.

(6) Remove the self-locking hexagonal nut (7) from the selector-magnet cable stud (20); remove the electrical clamp (18) from the selector-magnet cable stud.

(7) Unsolder the six electrical wires of the selector-magnet cable (19) from the six terminal posts on the selector magnet (26) and tag the leads; remove the selector-magnet cable from the electrical clamp.

(8) Remove the selector-magnet cable stud (20), flat washer (21), lockwasher (22), machine screw (23), flat washer (24), and lockwasher (25) that attach the selector-magnet (26) and the magnet bracket (27) to the selector-magnet bracket (44); remove the selector-magnet and the magnet bracket.

(9) Remove the setscrew (28) that holds the bar magnet (29) in the selector-magnet bracket (44); scratch mark the magnet and bracket before removing the magnet from the selector-magnet bracket.

(10) Remove the setscrew (30) that holds armature mounting shaft (33) in the selector-magnet bracket (44).

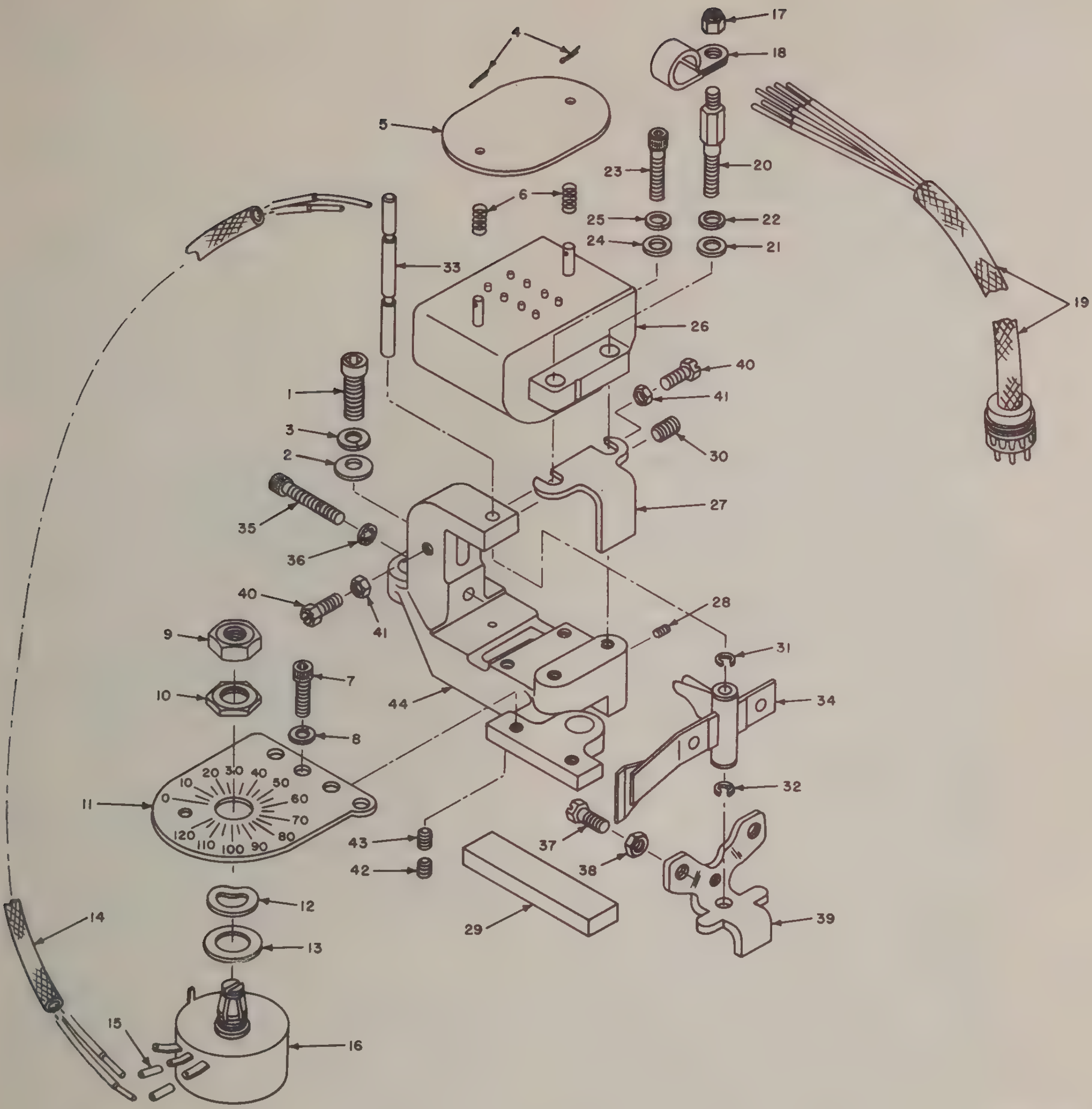
(11) Remove the retainer rings (31 and 32) from the armature mounting shaft (33); slide the armature mounting shaft from the armature (34) and from the selector-magnet bracket (44). Remove the armature from the selector-magnet bracket.

(12) Remove the machine screw (35) and lockwasher (36) that hold the armature stop bracket (39) on the selector-magnet bracket (39); remove the assembled stop bracket and machine screws (37).

(13) Remove the two machine screws (37) and the plain hexagonal nuts (38) from the armature stop bracket (39).

(14) Remove the two armature leaf spring stop screws (40) and plain hexagonal nuts (41) from the selector-magnet bracket (44).

(15) Remove the setscrews (42 and 43) from the selector-magnet bracket.



TM 2246-236

1	Machine screw, 10018
2	Flat washer, 10464
3	Lockwasher, 10420
4	Cotter pin, 10806
5	Cover, 56089
6	Cover spring, 56091
7	Machine screw, 10032
8	Lockwasher, 10430
9	Nut
10	Plain hexagonal nut, 10529
11	Potentiometer mounting bracket, 53333
14	Tubing, 20837
15	Tubing, 20732
16	Potentiometer (R–4), 20025 (includes item No. 9)
17	Self-locking hexagonal nut, 10501
18	Electrical clamp, 20513
19	Selector-magnet cable, 53545A
20	Selector-magnet cable stud, 56127
21	Flat washer, 50315
22	Lockwasher, 10430
23	Machine screw, 10011
24	Flat washer, 50315
25	Lockwasher, 10430
26	Selector magnet, 56126A
27	Bracket, 52292
28	Setscrew, 10220
29	Magnet, 52289
30	Setscrew, 10225
31	Retainer ring, 10969
32	Retainer ring, 10969
33	Armature lever mounting shaft, 52288
34	Armature, 54092A
35	Machine screw, 10010
36	Lockwasher, 10404
37	Machine screw, 53183
38	Plain hexagonal nut, 10507
39	Armature stop bracket, 52529
40	Armature leaf spring stop screw, 53183
41	Plain hexagonal nut, 10507
42	Setscrew, 10221
43	Setscrew, 10235
44	Magnet bracket, 52528

Figure 220. Selector magnet, exploded view.

b. Reassembly.

(1) Install the four setscrews (43 and 42) in the selector-magnet bracket (44), with the leading ends flush with the surface of the mounting bracket.

(2) Install the plain hexagonal nuts (41) on the armature leaf spring stop screws (40) about halfway up the threads; install the machine screws in the selector-magnet bracket.

(3) Install the plain hexagonal nuts (38) on the machine screws (37); install the machine screws in the armature stop bracket (39) with the ends of the machine screws approximately flush with the face of the armature stop bracket.

(4) Position the armature stop bracket (39) on the selector-magnet bracket; hold in place with a machine screw (35) and lockwasher (36).

(5) Position the armature (34) in the selector magnet bracket (44); insert the armature mounting shaft (33) through the selector-magnet bracket, armature, and armature stop bracket (39). Install the retainer rings (32 and 31) on the armature mounting shaft (33).

(6) Hold the armature mounting shaft (33) in the selector-magnet bracket (44) with a setscrew (30).

(7) Assemble the bar magnet (29) on the selector-magnet bracket (44); leave an air gap of .015 inch between the south pole of the bar magnet and the end of the armature stop bracket (39) (par. 318)· hold the bar magnet in place with a setscrew (28). The north pole of the bar magnet is designated by a red dot.

(8) Position the bracket (27) on the selector-magnet bracket (44) and on the end of the bar magnet for full surface contact.

(9) Position the selector magnet (26) on the selector-magnet bracket; hold the bracket (27) and the selector-magnet on the selector-magnet bracket with a lockwasher (25), flat washer (24), machine screw (23), lockwasher (22), flat washer (21), and selector-magnet cable stud (20). Adjust the position of the selector-magnet before tightening the mounting machine screw (23) and cable stud (20) (par. 319).

(10) Install the selector-magnet cable (19) through the electrical clamp (18); solder the ends of the six electrical wires in the cable and the two potentiometer wires to the proper terminal posts on the selector-magnet.

(11) Position the electrical clamp on the selector-magnet cable stud (20) and hold in place with the self-locking hexagonal nut (17).

(12) Slide the two pieces of insulating tubing (15) over the ends of the wires in the tuning (14); solder the two cable wires to the two terminal lugs on the potentiometer (16). Slide the two pieces of insulating tubing over the soldered connections.

(13) Place the flat washer (13) and the lockwasher (12) on the threaded bushing of the resistor (16); install the resistor on the potentiometer mounting bracket (11), hold it in place with the plain hexagonal nut (10). Draw up the locking nut (9) fingertight.

(14) Position the assembled potentiometer (16) and potentiometer mounting bracket (11) on the selector-magnet bracket (44); attach with the two lockwashers (8) and machine screws (7).

(15) Place the two cover springs (6) on the studs on the selector-magnet (26); position the cover (5) on the studs and hold in place with the two cotter pins (4).

(16) Adjust the selector-magnet attractive force and armature clearance as described in paragraph 320.

(17) Adjust the selector-magnet attractive force and leaf spring alinement as described in paragraph 321.

(18) Install the selector-magnet bracket (44) on the frame of the page printer with the two machine screws (1), flat washers (2), and lockwashers (3).

(19) Adjust the alinement of the selector and stop levers with the selector-magnet as described in paragraph 322.

(20) Adjust the alinement of the selector and Y-levers with the selector-magnet as described in paragraph 323.

(21) Adjust the clearance between the selector levers and the armature blade of the selector magnet as described in paragraph 324.

186. Disassembly and Reassembly of Rangefinder

(fig. 221)

a. Disassembly.

(1) Remove the two socket head machine screws (1) and lockwashers (2) that attach the selector lever comb bracket (18) to the frame of the page printer; remove the assembled selector lever comb bracket.

(2) Remove the two socket head machine screws (3) and lockwashers (4) that attach the selector lever guide comb (5) to the selector lever comb bracket (18); remove the selector lever guide comb.

(3) Remove the self-locking hexagonal nut (8) and the flat washer (9) that attach the orientation lever (10) to the orientation lever stud (11); remove the assembled orientation lever and machine screw (7).

(4) Remove the self-locking hexagonal nut (6) and machine screw (7) from the orientation lever (10).

(5) Remove the orientation lever stud (11).

(6) Remove the two setscrews (12) that hold the range finding cam (13) to the shaft of the range finder dial assembly (15); pull the dial assembly from the range finding cam (13) and the spacer (14).

(7) Remove the setscrew (16) that holds the positioning ball (17) in the selector lever comb bracket (18); remove the positioning ball.

b. Reassembly.

(1) Insert the positioning ball (17) in the selector lever comb bracket (18); hold loosely with a setscrew (16).

(2) Start the end of the shaft of the rangefinder dial assembly (15) in the hold in the selector lever comb bracket (18); position the spacer (14) and the range finding cam (13) on the shaft and complete the dial assembly installation. Hold the range finding cam on the shaft loosely with the two setscrews (12).

(3) Install the orientation lever stud (11 on the selector lever comb bracket (18).

(4) Install the machine screw (7) in the orientation lever (10) at approximately the correct position and lock with the self-locking hexagonal nut (6).

(5) Position the orientation lever (10) on the orientation stud (11); hold with a flat washer (9) and a self-locking hexagonal nut (8).

(6) Position the selector lever guide comb (5) on the selector lever comb bracket (18); attach with the two lockwashers (4) and machine screws (3). Push the ends of the levers with a small screwdriver while maneuvering the lever stop into position.

(7) Attach the selector lever comb bracket on the frame of the page printer with the two lockwashers (2) and machine screws (1).

(8) Adjust the rangefinder as described in paragraphs 298, 299, and 300.

187. Disassembly and Reassembly of Selector Levers and Y-Levers

(fig. 222)

a. Disassembly.

(1) Unhook the ends of the six selector lever springs (1) from the anchor post (2) and from the stop lever (35) and the five selector levers (32); remove the six springs.

(2) Remove the plain hexagonal nut (3) from the anchor post (2); remove the anchor post (2) from the page printer frame.

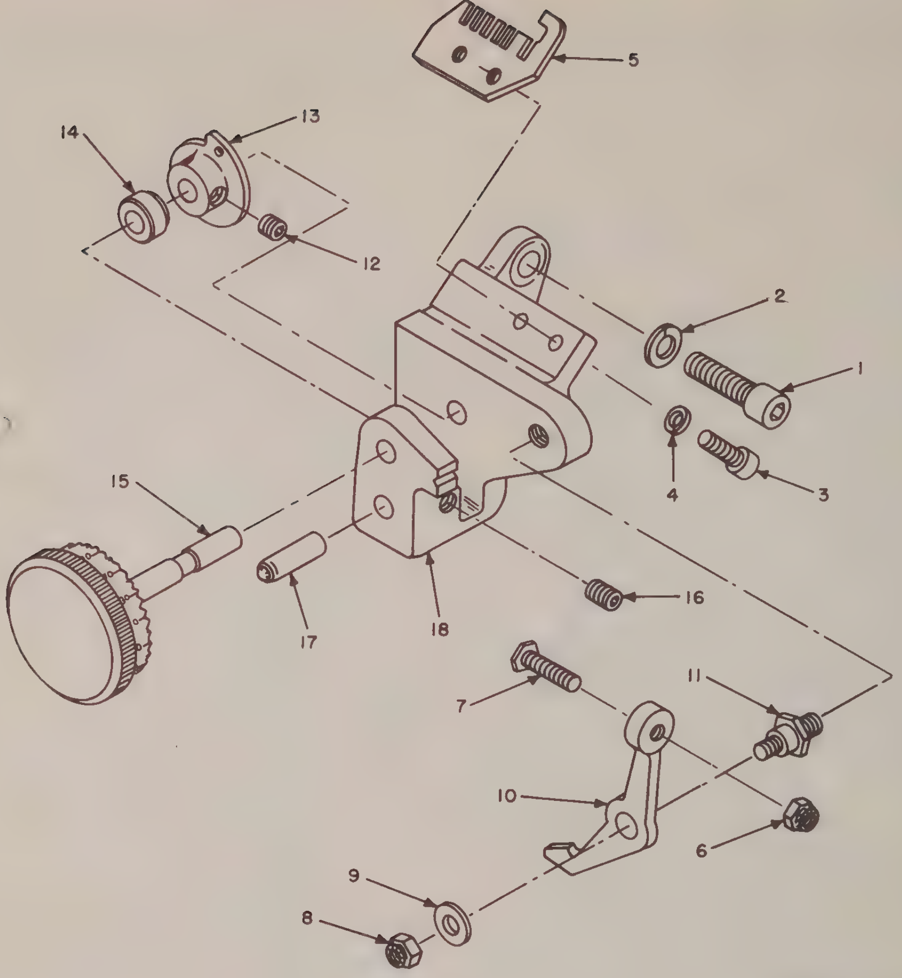
(3) Unhook the ends of the Y-lever detent springs (4) from the five Y-lever detents (9, 11, 13, 15, and 18) and from the Y-lever detent spring bracket (48); remove the Y-lever detent springs.

(4) Remove the nut (5), lockwasher (6), and centering sleeve (7) from the Y-lever detent pivot (47). Remove the five thrust washers (8, 10, 12, 14, and 16) and five Y-lever detents (9, 11, 13, 15, and 18) alternately and the flat washer (17) from the centering sleeve (7).

(5) Remove the two setscrews (19) that hold the spacing collar (20) on the end of the Y-lever pivot stud (52); remove the flat washers (21, 23, 25, 27, and 29) and Y-levers (22, 24, 26, 28, and 30) alternately and the collar (31) from the Y-lever pivot stud (52).

(6) Remove the five selector levers (32) from the bearings (37, 39, 41, 43, and 45).

(7) Remove the self-locking hexagonal nut (33) and the eccentric bearing (34) from the selector lever pivot stud (50); remove



1 Machine screw, 10018
2 Lockwasher, 10431
3 Machine screw, 10004
4 Lockwasher, 10429
5 Selector lever guide comb, 50511
6 Self-locking hexagonal nut, 10500
7 Machine screw, 10307
8 Self-locking hexagonal nut, 10500
9 Flat washer, 50414
10 Orientation lever, 53112
11 Orientation lever stud, 53111
12 Setscrew, 10201
13 Rangefinding cam, 50317
14 Spacer, 51424
15 Rangefinder dial assembly 52920A
16 Setscrew, 10203
17 Positioning ball, 53306A
18 Selector lever comb bracket, 53109

Figure 221. Rangefinder, exploded view.

the stop lever (35) and the flat washer (36).

(8) Remove the bearings (37, 39, 41, 43, and 45) and the flat washers (38, 40, 42, and 44) alternately and remove the collar (46) from the selector lever pivot stud (50).

(9) Remove the Y-lever detent pivot (47) and the Y-lever detent spring bracket (48) from the page printer frame.

(10) Remove the setscrew (49) that holds the selector lever pivot stud (50) to the page printer frame; remove the selector lever pivot stud.

(11) Remove the setscrew (51) that holds the Y-lever pivot stud (52) to the page printer frame; remove the Y-lever pivot stud.

(12) Remove the setscrew (53) that holds the Y-lever eccentric stop (54) to the page printer frame; remove the Y-stop lever.

b. Reassembly.

Note. When replacing either Y-levers or selector levers, replace an entire set. Do not use a combination of new and old levers.

(1) Position the Y-lever eccentric stop (54) in the page printer frame; hold with a setscrew (53).

(2) Position the Y-lever pivot stud (52) in the page printer frame; hold with a setscrew (51).

(3) Position the selector lever pivot stud (50) in the page printer frame; hold with a setscrew (49).

(4) Position the Y-lever detent spring bracket (48) on the page printer frame; hold by installing the Y-lever detent pivot (47).

(5) Install the collar (46), the bearings (45, 43, 41, 39, and 37), and the flat washers (44, 42, 40, and 38) alternately, and the flat washer (36) and stop lever (35) on the selector lever pivot stud (50); secure with an eccentric bearing (34) and self-locking hexagonal nut (33). Do not tighten the nut.

(6) Position the five selector levers (32) in their original positions on the five bearings.

(7) Assemble the collar (31), the Y-levers (30, 28, 26, 24, and 22), and flat washers (29, 27, 25, 23, and 21) alternately on the Y-lever pivot stud (52). Install the collar (20) on the Y-lever pivot stud (52); hold with the two setscrews (19).

(8) Install the thrust washers (8, 10, 12, 14, and 16) and the Y-lever detents (9, 11, 13, 15, and 18) alternately, with a flat washer (17) before the last detent (18) on the centering sleeve.

(9) Install the centering sleeve (7) on the Y-lever detent pivot (47); hold with a lockwasher (6) and plain hexagonal nut (5).

(10) Hook the ends of the five Y-lever detent springs (4) to the holes in the Y-lever detents and in the Y-lever detent spring bracket (48).

(11) Install the selector spring anchor post (2) in the page printer frame; lock the post with a plain hexagonal nut (3).

(12) Hook the six selector lever springs (1) in the holes in the selector spring anchor post (2) and to the five selector levers (32) and the stop lever (35).

(13) Adjust the selector levers and Y-levers as described in paragraphs 296, 297, 298, 313, 315, and 322.

188. Disassembly and Reassembly of Transfer Lever Shaft

(fig. 223)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the transfer lever spring (1) from the transfer lever assembly (32) and from the spring post eccentric (41).

(3) Remove the self-locking hexagonal nut (2) and flat washer (3), that hold the T-levers (4, 6, 8, 10, and 12) to the T-lever pivot stud (15) on the transfer lever roller stud (30); alternately remove the T-levers and the flat washers (5, 7, 9, and 11).

(4) Remove the plain hexagonal nut (13) and lockwasher (14) that hold the T-lever pivot stud (15) to the transfer lever assembly (32); remove the T-lever pivot stud.

(5) Remove the machine screw (16) that holds the clutch latch (21) to the transfer lever assembly (32); remove the assembled clutch latch and ball bearing (20).

(6) Remove the plain hexagonal nut (17), lockwasher (18), and machine screw (19) that hold the ball bearing (20) to the clutch latch (21); remove the ball bearing.

(7) Remove the machine screw (22) that holds the shaft collar (23) to the transfer lever assembly (32); remove the shaft collar.

(8) Remove the machine screw (24) that holds the shaft collar (26) to the transfer lever assembly (32), and the machine screw (25) that holds the shaft collar (27) to the shaft.

(9) Pull the transfer lever assembly (32) out of the bearing caps in the page printer frame, catching the shaft collars (26 and 27) as they fall from the shaft.

(10) Remove the spring stud (28) from the transfer lever assembly (32).

(11) Remove the self-locking hexagonal nut (29) that holds the transfer lever roller stud (30) to the transfer lever assembly (32); remove the transfer lever roller stud.

(12) Remove the spring (34) from the transfer lever latch (36) and from the springpost; remove the spring.

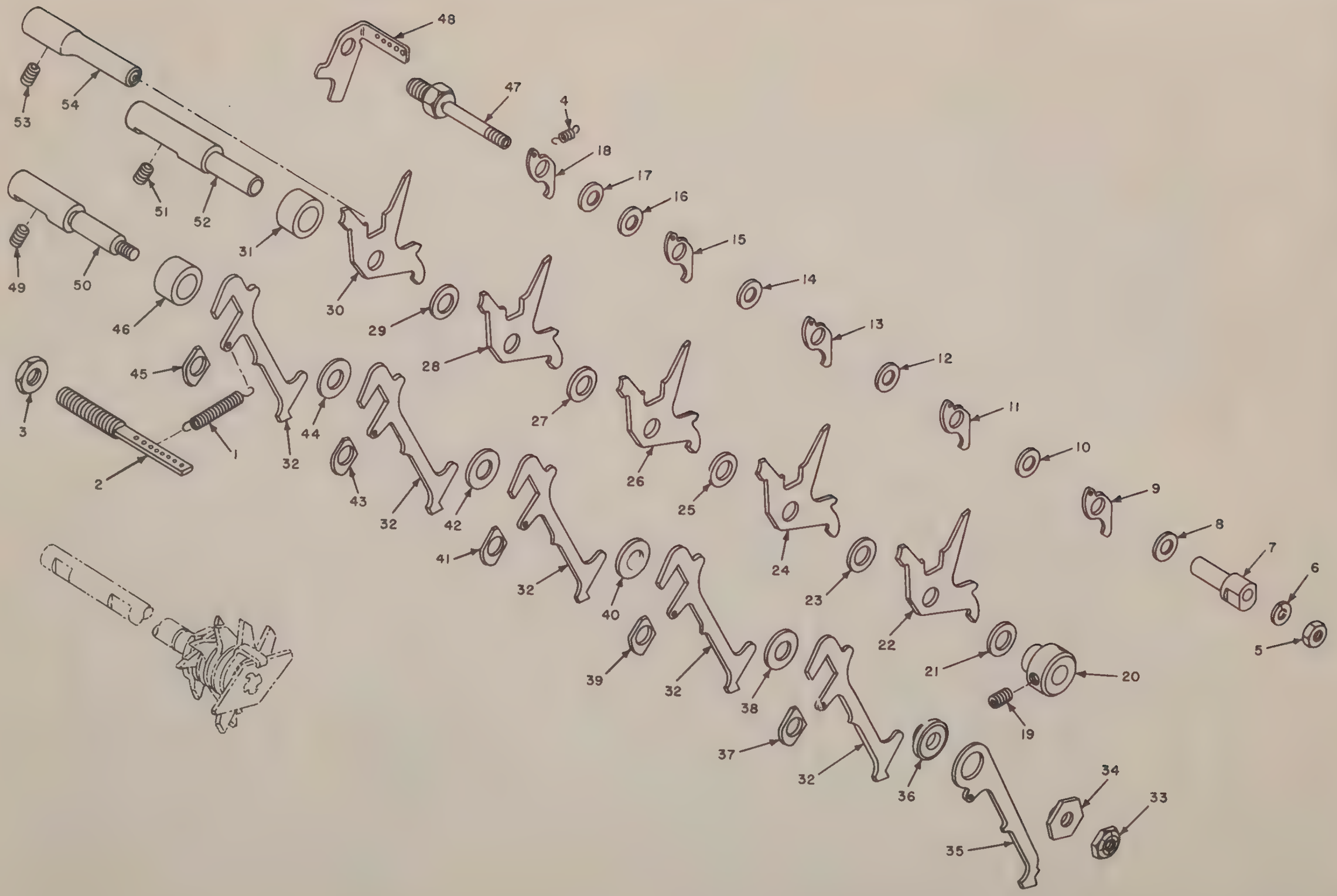
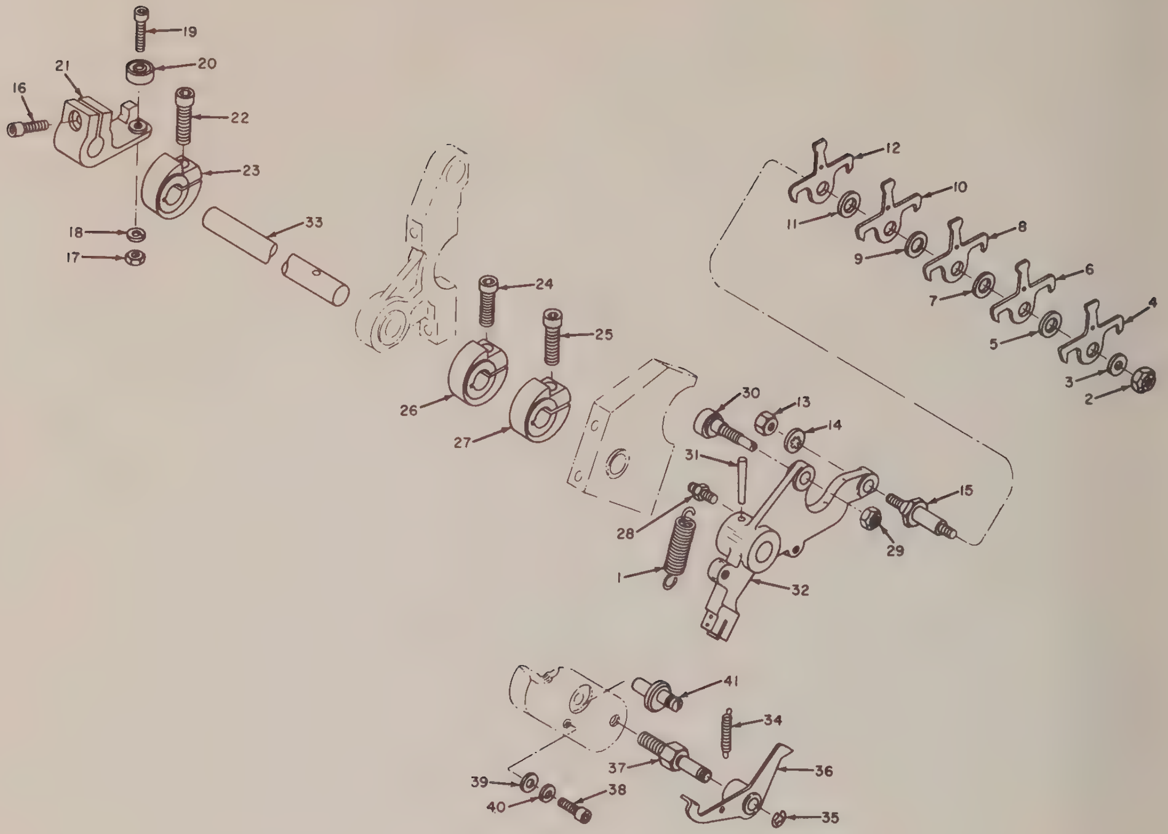


Figure 222. Selector levers and Y-levers, exploded view.

1 Selector lever spring, 50902 (5 reqd)
2 Anchor post, 50325
3 Plain hexagonal nut, 10509
4 Y-lever detent spring, 55009 (5 reqd)
5 Plain hexagonal nut, 10504
6 Lockwasher, 10434
7 Centering sleeve, 55007
8 Thrust washer, 55001 (consists of set of 5, items 8, 10, 12, 14, and 16)
9 Y-lever detent. 55004 (consists of set of 5, items 9, 11, 13, 15, and 18)
10 Thrust washer
11 Y-lever detent
12 Thrust washer
13 Y-lever detent
14 Thrust washer
15 Y-lever detent
16 Thrust washer
17 Flat washer, 55076
18 Y-lever detent
19 Setscrew, 10209
20 Spacing collar, 55006
21 Flat washer, 50148 (consists of set of 5, items 21, 23, 25, 27, and 29)
22 Y-lever, 55003 (consists of set of 5, items 22, 24, 26, 28, and 30)
23 Flat washer
24 Y-lever
25 Flat washer
26 Y-lever
27 Flat washer
28 Y-lever
29 Flat washer
30 Y-lever
31 Collar, 51416
32 Selector lever, 51068A (consists of set of 5)
33 Self-locking hexagonal nut, 10500
34 Eccentric bearing, 55024
35 Stop lever, 50014
36 Flat washer, 50053
37 Bearing, 51604A (consists of set of 5, items 37, 39. 41, 43, and 45)
38 Flat washer, 50147 (consists of set of 4, items 38, 40, 42, and 44)
39 Bearing
40 Flat washer
41 Bearing
42 Flat washer
43 Bearing
44 Flat washer
45 Bearing
46 Collar, 51416
47 Y-lever detent pivot, 55008
48 Y-lever detent spring bracket, 55002
49 Setscrew, 10211
50 Selector lever pivot stud, 53268
51 Setscrew, 10211
52 Y-lever pivot stud, 53269
53 Setscrew, 10211
54 Y-lever eccentric stop, 50152

Figure 222—Continued.



1 Transfer lever spring, 50903
2 Self-locking hexagonal nut, 10500
3 Flat washer, 50414
4 T-lever, 51066A (includes items 4, 6, 8, 10, and 12)
5 Flat washer, 50148 (includes items 5, 7, 9, and 11)
6 T-lever
7 Flat washer
8 T-lever
9 Flat washer
10 T-lever
11 Flat washer
12 T-lever
13 Plain hexagonal nut, 50651
14 Lockwasher, 10404
15 T-lever pivot stud, 50650
16 Machine screw, 10008
17 Plain hexagonal nut, 10504
18 Lockwasher, 10434
19 Machine screw, 10000
20 Ball bearing, 10754
21 Clutch latch, 50535
22 Machine screw, 10010
23 Shaft collar, 53973
24 Machine screw, 10010
25 Machine screw, 10010
26 Shaft collar, 53973
27 Shaft collar, 53973
28 Spring stud, 50649
29 Self-locking hexagonal nut, 10501
30 Transfer lever roller stud, 56185A
31 Taper pin
32 Transfer lever assembly 52394A (includes items 31 and 33)
33 Transfer lever shaft
34 Spring, 50904
35 Retainer ring, 10949
36 Transfer lever latch, 50020A
37 Transfer lever latch stud, 52319
38 Machine screw, 10003
39 Flat washer, 50839
40 Lockwasher, 10429
41 Spring post eccentric, 56076

Figure 223. Transfer lever shaft, exploded view.

(13) Remove the retainer ring (35) that holds the transfer lever latch (36) to the transfer lever latch stud (37) on the page printer frame; remove the transfer lever latch.

(14) Remove the transfer lever latch stud (37) from the page printer frame.

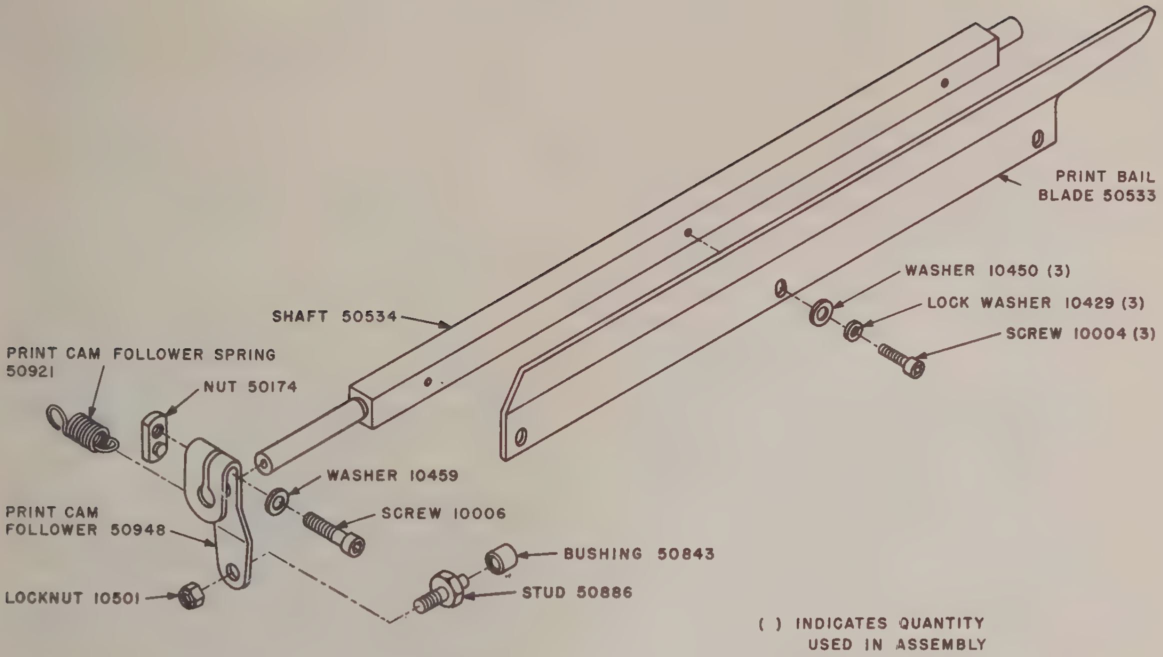
(15) Remove the machine screw (38), flat washer (39), and lockwasher (40) that hold the spring post eccentric (41) to the printer frame; remove the spring post eccentric.

b. Reassembly.

(1) Position the spring post eccentric (41) on the page printer frame; secure with a machine screw (38), lockwasher (40), and flat washer (39).

(2) Install the transfer lever latch stud (37) on the page printer frame.

(3) Position the transfer lever latch (36) on the transfer lever latch stud (37); secure with a retainer ring (35).



( ) INDICATES QUANTITY
USED IN ASSEMBLY

Figure 224. Print bail blade shaft, exploded view.

(4) Install the spring (34) on the transfer lever latch (36) and on the spring post.

(5) Position the transfer lever roller stud (30) on the transfer lever; secure with a self-locking hexagonal nut (29).

(6) Install the spring stud (28) on the transfer lever assembly (32).

(7) Insert the transfer lever assembly (32) part of the way in the bushing in the bearing block; install the two shaft collars (27) and (26) on the shaft. Position the assembled shaft and transfer lever assembly (32) in the bearing blocks.

(8) Install the machine screw (25) that holds the shaft collar (27) and the machine screw (24) that holds the shaft collar (26) to the transfer lever shaft.

(9) Position the shaft collar (23) on the transfer lever shaft; secure with a machine screw (22).

(10) Position the ball bearing (20) on the clutch latch (21); secure with a machine screw (19), lockwasher (18), and plain hexagonal nut (17).

(11) Position the assembled clutch latch (21) and ball bearing (20) on the transfer lever assembly (32); secure with a machine screw (16).

(12) Position the T-lever pivot stud (15) on the transfer lever assembly (32); secure with a lockwasher (14) and plain hexagonal nut (13).

(13) Install the T-levers (12, 10, 8, 6, and 4) and the flat washers (11, 9, 7, and 5) on the T-lever pivot stud (15), alternating T-levers and flat washers until all are installed. Secure with a flat washer (3) and a self-locking hexagonal nut (2).

(14) Install the transfer lever spring (1) on the transfer lever and on the spring post eccentric (41).

(15) Adjust the transfer lever shaft and the clutch latch as described in paragraphs 310, 311, 312, 314, 325, 326, and 327.

(16) Replace the page printer on the printer base as described in paragraph 152*b*.

189. Disassembly and Reassembly of Printer Bail Blade Shaft

(fig. 224)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the transfer lever shaft as described in paragraph 188*a*.

(3) Remove the two setscrews that hold the print cam to the function shaft; slide the print cam to the selector side of the page printer. *Be careful not to lose the bushing on the cam follower stud.*

(4) Remove print cam follower spring 50921 from the print cam follower and from the spring post on the printer frame.

(5) Remove two screws and lockwashers that hold the middle bearing cap to the frame assembly; remove the middle bearing cap by sliding it toward the selector side.

(6) Remove the assembled shaft 50534, print bail blade 50533, and print cam follower 50948 by moving it toward the selector side, free of the bearing.

(7) Remove bushing 50843, locknut 10501, and stud 50886 from the print cam follower.

(8) Remove nut 50174, screw 10006, and washer 10459 that hold print cam follower 50948 to shaft 50534; remove the follower.

(9) Remove three screws 10004, lockwashers 10429, and washers 10450 that hold print bail blade 50533 to shaft 50534; remove the blade.

b. Reassembly.

(1) Position print bail blade 50533 on shaft 50534; secure with three screws 10004, lockwashers 10429, and washers 10450.

(2) Position print cam follower 50948 on shaft 50534; secure with screw 10006, washer 10459, and nut 50174.

(3) Position stud 50886 on the follower; secure with locknut 10501. Install bushing 50843 on the stud.

(4) Install the end of the shaft in the bushing in the function side of the page printer frame.

(5) Position the bearing cap on the opposite end of the shaft; secure the bearing cap to the frame with two screws and lockwashers.

(6) Install print cam follower spring 50921 on the cam follower and on the spring post on the printer frame.

(7) Slide the print cam to engage the print cam follower; secure the cam to the function shaft with two setscrews.

(8) Install the transfer lever shaft as described in paragraph 188*b*.

(9) Adjust the print bail blade shaft as described in paragraphs 374 and 375.

(10) Replace the page printer on the printer base as described in paragraph 152*b*.

190. Disassembly and Reassembly of Signal Bell

(fig. 225)

a. Disassembly.

(1) Remove two screws 10008 and lockwashers 10430 that hold signal bell bracket 53157A to the page printer frame; remove the signal bell assembly.

(2) Remove locknut 10501 that holds signal bell 50180 to bracket 53157A; remove signal bell 51080.

(3) Remove screw 10010 and locknut 10501 that hold clapper stop 51102 to signal bell bracket 53157A; remove clapper stop 51102.

(4) Remove spring 50920 from clapper 50879A and from signal bell bracket 53157A.

(5) Remove E-ring 10949 that holds signal bell clapper 50879A to the stud on signal bell bracket 53157A; remove signal bell clapper 50879A.

(6) Remove spring 50919 from motor-stop function lever 50874 and from the spring post on signal bell bracket 53157A.

(7) Remove E-ring 10949 that holds motor-stop function lever 50874 to the stud on signal bell bracket 53157A; remove motor-stop function lever 50874.

b. Reassembly.

(1) Position motor stop function lever 50874 on the center stud on signal bell bracket 53157A; secure with E-ring 10949.

(2) Install spring 50519 on the spring post on signal bracket 53157A and on motor stop function lever 50874.

(3) Position signal bell clapper 50879A on the stud on signal bell bracket 53157A; secure with E-ring 10949.

(4) Position spring 50920 on signal bell clapper 50879A and on signal bell bracket 53157A.

(5) Position clapper stop 51102 on signal bell bracket 53157A; secure with screw 10010 and locknut 10501.

(6) Position signal bell 50180 on screw 10010; secure with locknut 10501.

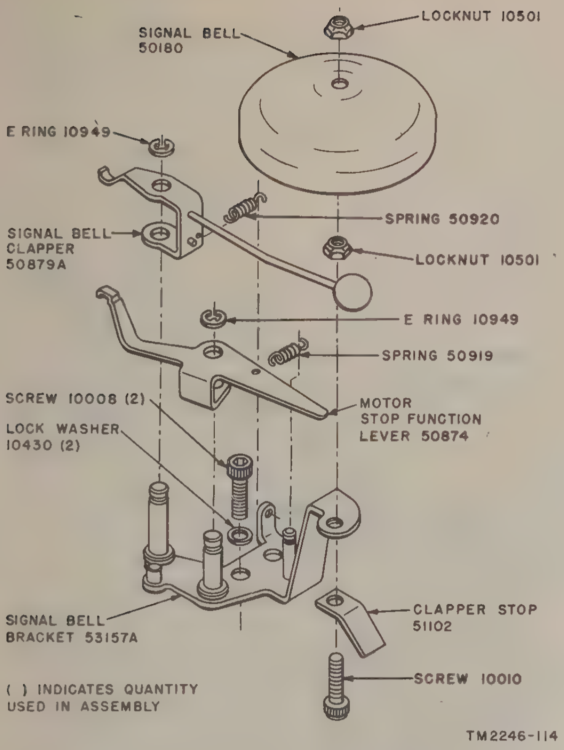


Figure 225. Signal bell, exploded view.

(7) Adjust the signal bell as instructed in paragraph 386.

191. Disassembly and Reassembly of Function Mechanism

(fig. 226)

a. Disassembly.

(1) Remove the self-locking hexagonal nut (1) that holds the manual space bracket to the mounting bracket stud (2); remove the manual space bracket.

(2) Remove the mounting bracket stud (2), lockwasher (3), mounting bracket stud (4), and lockwasher (5) that hold the function bracket (25) to the function side of the page printer frame.

(3) Remove the retainer ring (6) that holds the carriage feed link to the carriage feed lever (22); remove the assembled function bracket mechanism.

(4) Remove the platen latch spring (7) from the platen latch (9) and from the spring post on the function bracket (25).

(5) Remove the retainer ring (8) that holds the platen latch (9) to the stud on the function bracket (25); remove the platen latch.

(6) Remove the supporting lever spring (10) from the support lever (18) and from the stud on the function bracket (25).

(7) Remove the retainer ring (11) that holds the pin (12) to the function bracket (25); remove the pin and remove the assembled function cam follower (15) and support lever (18).

(8) Remove the cam follower roller (13) from the function cam follower (15).

(9) Remove the retainer ring (14) that holds the function cam follower (15) to the stud on the support lever (18); remove the follower.

(10) Remove the self-locking hexagonal nut (16) that holds the function cam follower pivot stud (17) to the support lever (18); remove the function cam follower pivot stud.

(11) Remove the two setscrews (19) that hold the shaft collar (21) to the pivot (20); remove the pivot, catching the shaft collar carriage feed lever (22), spacer (23), and unshift lever (24) as they fall from the pivot.

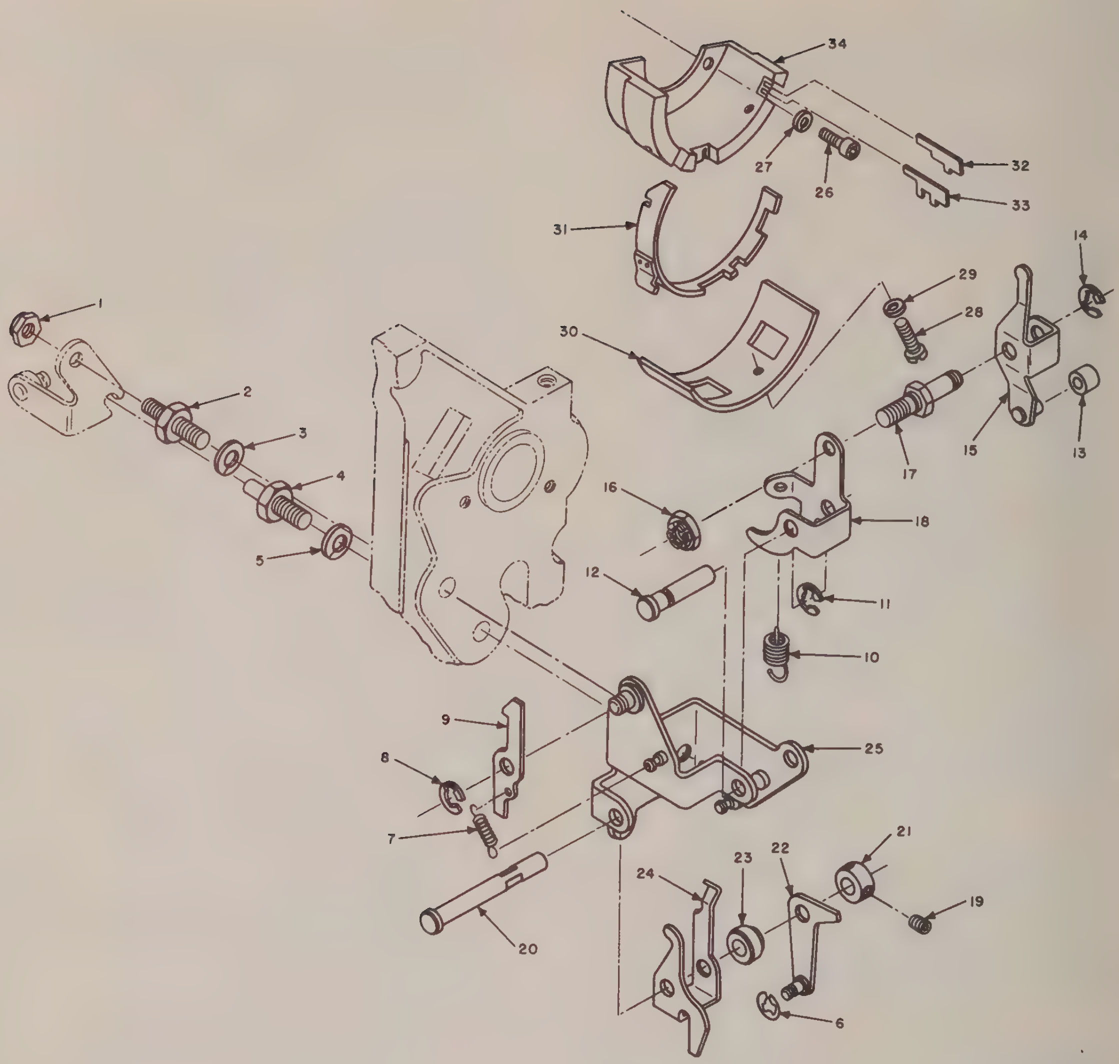
(12) Remove the two machine screws (26) and lockwashers (27) that hold the punch bar guide block (34) to the function side of the page printer frame; remove the guide block.

(13) Remove the two machine screws (28) and lockwashers (29) that hold the side plate (30) to the punch bar guide block (34); remove the side plate aperture gate (31), signal bell punch bar (32), and letter and motor stop punch bars (33) from the punch bar guide block (34).

b. Reassembly.

(1) Position the letter and motor stop punch bars (33), signal bell punch bar (32), and aperture gate (31) in the punch bar guide block (34). Position the side plate (30) on the guide block; secure with the two machine screws (28) and lockwashers (29).

(2) Position the punch bar guide block (34) on the function side of the page printer frame; secure with the two machine screws (26) and lockwashers (27).



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1 Self-locking hexagonal nut, 10501
2 Mounting bracket stud, 55501
3 Lockwasher, 10431
4 Mounting bracket stud, 55502
5 Lockwasher, 10431
6 Retainer ring, 10960
7 Platen latch spring, 52501
8 Retainer ring, 10949
9 Platen latch, 50821
10 Supporting lever spring, 50915
11 Retainer ring, 10949
12 Pin, 53131
13 Cam follower roller, 50843
14 Retainer ring, 10949
15 Function cam follower, 50822A
16 Self-locking hexagonal nut, 10501
17 Functional cam follower pivot stud, 52553
18 Support lever, 50760
19 Setscrew, 10201
20 Pivot, 50829
21 Shaft collar, 50391
22 Carriage feed lever, 53129A
23 Spacer, 51424
24 Unshift lever, 52445
25 Function bracket, 52543A
26 Machine screw, 10004
27 Lockwasher, 10429
28 Machine screw, 10304
29 Lockwasher 10429
30 Side plate, 50735
31 Aperture gate, 50743A
32 Signal bell punch bar, 50881
33 Letter and motor stop punch bar, 50755
34 Punch bar guide block, 51428

Figure 226. Function mechanism, exploded view.

(3) Insert the pivot (20) in the drilled hole in the function bracket (25); install the unshift lever (24), spacer (23), carriage feed lever (22), and shaft collar (21) on the pivot. Insert the pivot all of the way into the bracket and secure the shaft collar to the pivot by installing the two setscrews (19).

(4) Position the function cam follower pivot stud (17) on the support lever (18); secure with a self-locking hexagonal nut (16).

(5) Position the function cam follower (15) on the function cam follower pivot stud (17); secure with a retainer ring (14).

(6) Install the cam follower roller (13) on the function cam follower (15).

(7) Position the assembled function cam follower (15) and support lever (18) on the function bracket (25); install the pin (12). Secure the pin to the bracket with a retainer ring (11).

(8) Install the supporting lever spring (10) on the support lever (18) and on the spring post on the function bracket (25).

(9) Position the platen latch (9) on the stud on the function bracket (25); secure with a retainer ring (8).

(10) Install the platen latch spring (7) on the platen latch (9) and on the spring post on the function bracket (25).

(11) Position the carriage feed link on the carriage feed lever (22); secure with a retainer ring (6).

(12) Position the function bracket on the function side of the page printer frame; secure with a mounting bracket stud (4), lockwasher (5), mounting bracket stud (2), and lockwasher (3).

(13) Position the manual space bracket on the bracket mounting stud (2); secure with a self-locking hexagonal nut (1).

(14) Readjust as required following applicable adjustments under page printer adjustment procedures.

192. Disassembly and Reassembly of Line Feed and Platen Shift

(fig. 227)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the retainer ring (1, fig. 227) that holds the delaying lever (2) on the mounting stud on the stop bar shift link bracket (9); remove the delaying lever (2).

(3) Remove the delaying latch spring (3) from the delaying latch (5) and from the stop bar shift link bracket (9).

(4) Remove the retainer ring (4) and the delaying latch (5) from the pivot stud on the stop bar shift link bracket (9).

(5) Remove the machine screw (6) and lockwasher (7) from the bell crank pivot bracket (37); catch the flat washer (8) as it drops out.

(6) Remove the adjustable bell crank spring (10) from the adjustable bell crank (17) and from the bell crank pivot bracket.

(7) Remove the line feed and figures-shift cam follower spring (11) from the platen shift cam follower (27) and from the line feed cam follower (13).

(8) Remove the retainer ring (12) from the pivot stud on the line feed bell crank (24); slide the line feed cam follower (13) down to unhook it from the function shaft. Remove the line feed cam follower.

(9) Remove the self-locking hexagonal nut (14), flat washer (16), and machine screw (15) that secure the adjustable bell crank (17) to the line feed bell crank (24); remove the adjustable bell crank.

(10) Remove the retainer ring (18) from the pivot stud on the line feed bell crank (24).

(11) Remove the two machine screws (19), flat washers (20), and lockwashers (21) that hold the connecting link (23) to the connecting link (22); remove the connecting link (23) from the connecting link (22).

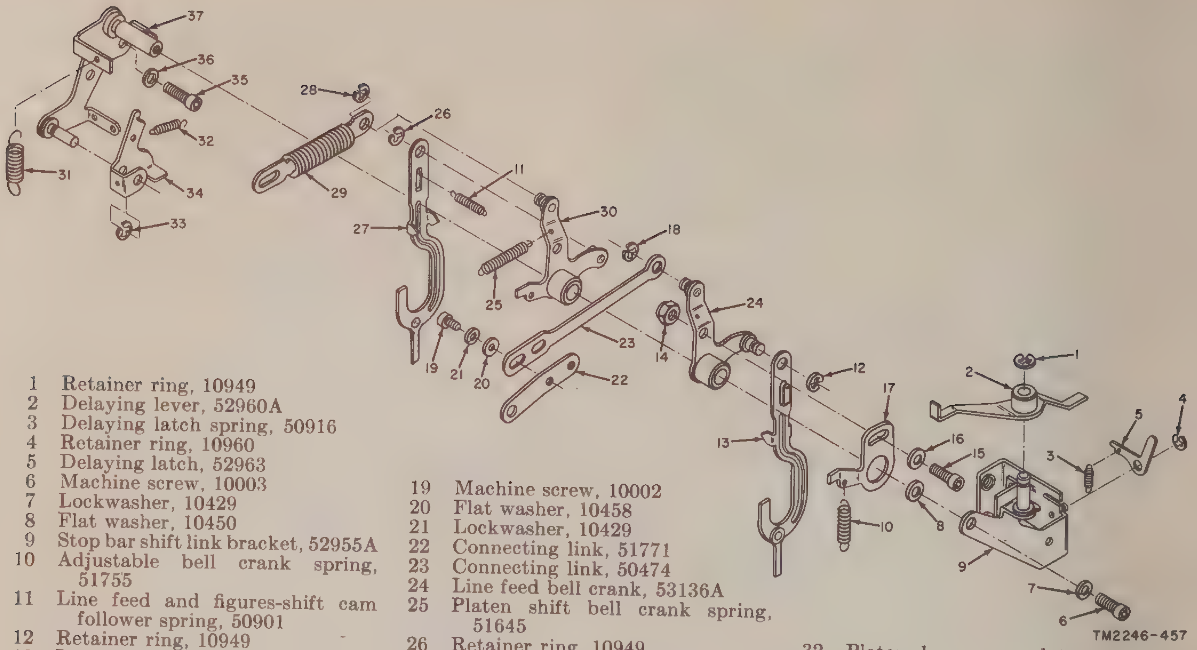
(12) Remove the line feed bell crank (24).

(13) Remove the platen shift bell crank spring (25) from the platen shift bell crank (30) and from the platen bracket link.

(14) Remove the setscrew (36, fig. 221) that holds the spacing collar (37) to the cam follower stop stud (38); remove the spacing collar and the cam follower stop stud.

(15) Remove the retainer ring (26, fig. 227) from the pivot stud on the platen shift bell crank (30); slide the platen shift cam follower (27) down to clear the function shaft. Remove the platen shift cam follower.

(16) Remove the retainer ring (28) from the pivot stud on the platen shift bell crank



1 Retainer ring, 10949
2 Delaying lever, 52960A
3 Delaying latch spring, 50916
4 Retainer ring, 10960
5 Delaying latch, 52963
6 Machine screw, 10003
7 Lockwasher, 10429
8 Flat washer, 10450
9 Stop bar shift link bracket, 52955A
10 Adjustable bell crank spring, 51755
11 Line feed and figures-shift cam follower spring, 50901
12 Retainer ring, 10949
13 Line feed cam follower, 51714A
14 Self-locking hexagonal nut, 10500
15 Machine screw, 10003
16 Flat washer, 10450
17 Adjustable bell crank, 53462
18 Retainer ring, 10949
19 Machine screw, 10002
20 Flat washer, 10458
21 Lockwasher, 10429
22 Connecting link, 51771
23 Connecting link, 50474
24 Line feed bell crank, 53136A
25 Platen shift bell crank spring, 51645
26 Retainer ring, 10949
27 Platen shift cam follower, 51712A
28 Retainer ring, 10949
29 Platen shift link, 56676A
30 Platen shift bell crank, 53135A
31 Carriage-return bell crank spring, 50906
32 Platen lower case latch spring, 50920
33 Retainer ring, 10960
34 Platen lower case latch, 52748
35 Machine screw, 10025
36 Lockwasher, 10430
37 Bell crank pivot bracket, 52303A

Figure 227. Line feed and platen shift mechanism, exploded view.

(30); remove the platen shift link (29) from the pivot stud.

(17) Remove the platen shift bell crank (30).

(18) Remove the carriage return bell crank spring (31) from the bell crank pivot bracket (37) and from the carriage return sensing lever.

(19) Remove the platen lower case latch spring (32) from the platen lower case latch (34) and from the bell crank pivot bracket (37).

(20) Remove the retainer ring (33) from the pivot post on the bell crank pivot bracket (37); remove the platen lower case latch (34).

(21) Remove the two machine screws (35) and lockwashers (36) that attach the bell crank pivot bracket (37) to the page printer frame; remove the bell crank pivot bracket.

b. Reassembly.

(1) Position the bell crank pivot bracket (37) on the page printer frame; attach with the two lockwashers (36) and machine screws (35).

(2) Position the platen lower case latch (34) on the pivot stud of the bell crank pivot bracket (37); hold with a retainer ring (33).

(3) Hook one end of the platen lower case latch spring (32) to the bell crank pivot bracket (37) and the other end to the platen lower case latch (34).

(4) Hook one end of the carriage return bell crank spring (31) to the carriage return sensing lever and the other end to the bell crank pivot bracket (37).

(5) Position the platen shift link (29) on the pivot stud of the bell crank pivot bracket (37); hold with a retainer ring (28).

(6) Position the platen shift cam follower (27) on the function shaft, place the top of the cam follower on the pivot stud on the platen shift bell crank (30); hold with a retainer ring (26).

(7) Install the cam follower stop stud (38, fig. 215) on the page printer frame. Position the spacing collar (37) on the cam follower stop stud; secure with a setscrew (36).

(8) Hook one end of the platen shift bell crank spring (25, fig. 234) on the platen shift bell crank (30) and the other end on the platen bracket link.

(9) Position the line feed bell crank (24) on the bell crank pivot bracket (37).

(10) Position the connecting link (23) on the connecting link (22); hold them together with the two lockwashers (21), flat washers (20), and machine screws (19).

(11) Place the end of the connecting link (23) over the pivot stud on the line feed bell crank (24); hold with a retainer ring (18).

(12) Position the adjustable bell crank (17) on the line feed bell crank (24); hold with a machine screw (15), flat washer (16), and self-locking hexagonal nut (14).

(13) Position the line feed cam follower (13) on the function shaft; place the top of the line feed cam follower on the pivot stud on the line feed bell crank (24); hold with the retainer ring (12).

(14) Install the line feed and figures-shift cam follower spring (11) between the platen shift cam follower (27) and the line feed cam follower (13).

(15) Install the adjustable bell crank spring (10) on the adjustable bell crank (17) and on the bell crank pivot bracket (37).

(16) Position the flat washer (8) under the stop bar shift link bracket (9); hold the stop bar shift link bracket on the bell crank pivot bracket (37) with a lockwasher (7) and machine screw (6).

(17) Position the delaying latch (5) on the pivot stud on the stop bar shift link bracket; hold with a retainer ring (4).

(18) Install the delaying latch spring (3) on the delaying latch (5) and on the stop bar shift link bracket (9).

(19) Position the delaying lever (2) on the mounting stud on the top of the stop bar shift link bracket (9); hold with a retainer ring (1).

(20) Adjust the line feed and platen shift mechanism as described in paragraphs 365, 366, 381, 382, 383, and 384.

(21) Install the page printer on the printer base as described in paragraph 152*b*.

193. Disassembly and Reassembly of Square Shaft

(fig. 228)

a. Disassembly.

(1) Loosen the four set screws (10) that hold the square shaft driven gear (11) to the square shaft and to the stop arm shaft.

(2) Remove the assembled cam follower support lever and function cam follower as described in paragraph 191*a*(7).

(3) Remove the function selecting arm (1) and function selecting arm spring (2) from the square shaft (13).

(4) Remove the machine screw (3) that holds the function selecting arm claw (4) to the square shaft (13); remove the function selecting arm claw, spring retainer (5), square shaft bearing spring (6); and spring retainer (7).

(5) Move the square shaft (13) axially toward the function side, dislodging the ball bearing (8) from its seat in the page printer frame; remove the bearing and spacing collar (9) from the shaft.

(6) Pull the square shaft (13) through the opening in the page printer frame, catching the square shaft driven gear (11) and sliding helical gear (12) as they fall from the shaft.

b. Reassembly.

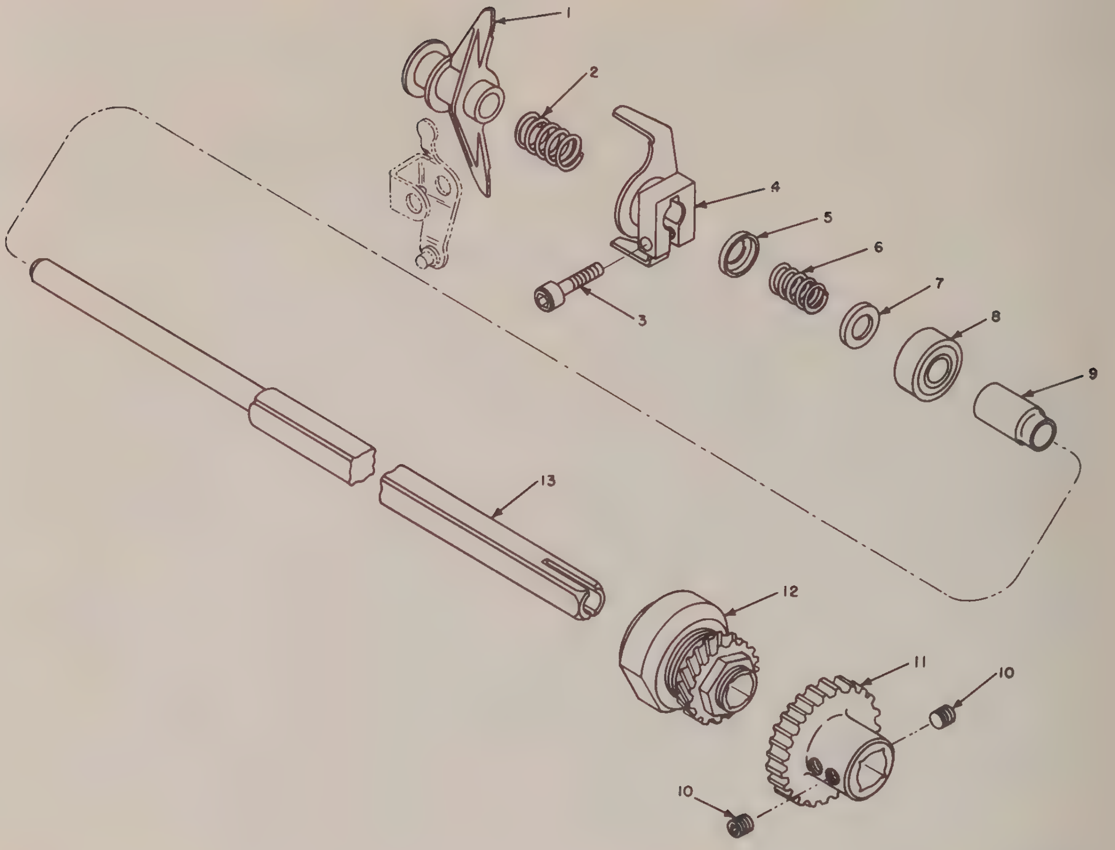
(1) Insert the square shaft (13) into the opening in the function side of the page printer frame; install the sliding helical gear (12) and the square shaft driven gear (11) on the square shaft.

(2) Install the end of the square shaft (13) on the stop arm shaft so that the stop arm shaft is inserted in the hole in the end of the square shaft. Position the square shaft driven gear (11) on the slotted end of the square shaft and secure with the four setscrews (10).

(3) Install the spacing collar (9), ball bearing (8), spring retainer (7), square shaft bearing spring (6), and spring retainer (5) on the square shaft (13).

(4) Position the function selecting arm claw (4) on the square shaft (13), secure with a machine screw (3).

(5) Install the function selecting arm spring (2) and function selecting arm (1) on the square shaft (13).



1 Function selecting arm, 50936
2 Function selecting arm spring, 50917
3 Machine screw, 10009
4 Function selecting arm claw, 50841A
5 Springeta riner, 56277
6 Square shaft bearing spring, 56279
7 Spring retainer, 56277
8 Ball bearing, 10753
9 Spacing collar, 56278
10 Setscrew, 10209
11 Square shaft driven gear, 50383
12 Sliding helical gear, 50565A
13 Square shaft, 50456

Figure 228. Square shaft, exploded view.

(6) Replace the assembled function cam follower support lever and function cam follower as described in paragraph 191*b*(7).

(7) Adjust the square shaft as described in paragraphs 304, 305, and 352.

194. Removal and Replacement of Page Printer Function Shaft

(fig. 229)

a. Removal.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the signal bell and motor stop function lever from the function side of the page printer frame as described in paragraph 190*a*.

(3) Remove the transfer lever shaft as described in paragraph 188*a*.

(4) Remove the print bail blade shaft as described in paragraph 189*a*.

(5) Remove the figures shift and line feed cam follower spring as described in paragraph 192*a*(7).

(6) Remove the line feed cam follower described in paragraph 192*a*(8).

(7) Remove the cam follower stop stud as described in paragraph 192*a*(14).

(8) Remove the platen shift cam follower as described in paragraph 192*a*(15).

(9) Remove the two machine screws (1, fig. 229) and lockwashers (2) that hold the bearing cap to the function side of the

page printer frame; remove the bearing cap.

(10) Remove the machine screw (3), lockwasher (4), machine screw (5), and lockwasher (6) that hold the center bearing cap to the center frame; slide the bearing cap toward the selector side of the page printer to clear the print bail blade shaft and remove the center bearing cap.

(11) Remove the two machine screws (7) and lockwashers (8) that hold the bearing cap to the selector side of the page printer frame; remove the bearing cap.

(12) Loosen the two setscrews (41) that hold the print cam (42) to the function shaft (46); slide the print cam out of engagement with the bushing on the print cam follower.

(13) Remove the assembled function shaft (46) by pulling it upward and outward from the three bearing supports in the page printer frame.

b. Replacement.

(1) Position the assembled function shaft (46) on the page printerframe with the bearings resting in the b aring supports on the frame.

(2) Position the bearing cap on the selector side of the page printer frame; secure with two machine screws (7) and lockwashers (8).

(3) Position the center bearing cap on the center frame; secure with a machine screw (5), lockwasher (6), machine screw (3), and lockwasher (4).

(4) Position the bearing cap on the function side of the page printer frame; secure with two machine screws (1) and lockwashers (2).

(5) Move the print cam (42) into engagement with the bushing on the print cam follower; secure by tightening the two setscrews (41).

(6) Install the platen shift cam follower as described in paragraph 192*b*(6).

(7) Install the cam follower stop stud as described in paragraph 192*b*(7).

(8) Install the line feed cam follower as described in paragraph 192*b*(13).

(9) Install the figures shift and line feed cam follower spring as described in paragraph 192*b*(14).

(10) Install the print bail blade shaft as described in paragraph 189*b*.

(11) Install the transfer lever shaft as described in paragraph 188*b*.

(12) Install the signal bell and motor-stop function lever from the function side of the page printer frame as described in paragraph 190*b*.

(13) Adjust the function shaft as described in paragraphs 306, 328, 330, and 351.

(14) Install the page printer on the printer base as described in paragraph 152*b*.

195. Disassembly and Reassembly of Function Shaft

(fig. 229)

a. Disassembly.

(1) Remove the function shaft from the page printer as described in paragraph 194*a*.

(2) Remove the machine screw (9), lockwasher (10), and flat washer (11) that hold the transfer lever restoring cam (12) to the function shaft (46); remove the transfer lever restoring cam, flat washer (13), locking bail cam (14), flat washer (15), flat washer (16), ball bearing (17), and flat washer (18) from the function shaft.

(3) Remove the two setscrews (19) that hold the line feed and platen shift sensing cam (20) to the function shaft (46); remove the line feed and platen shift sensing cam, friction plate (21), square shaft driving gear (22), friction plate (23), friction clutch plate (24), and clutch pressure spring (25).

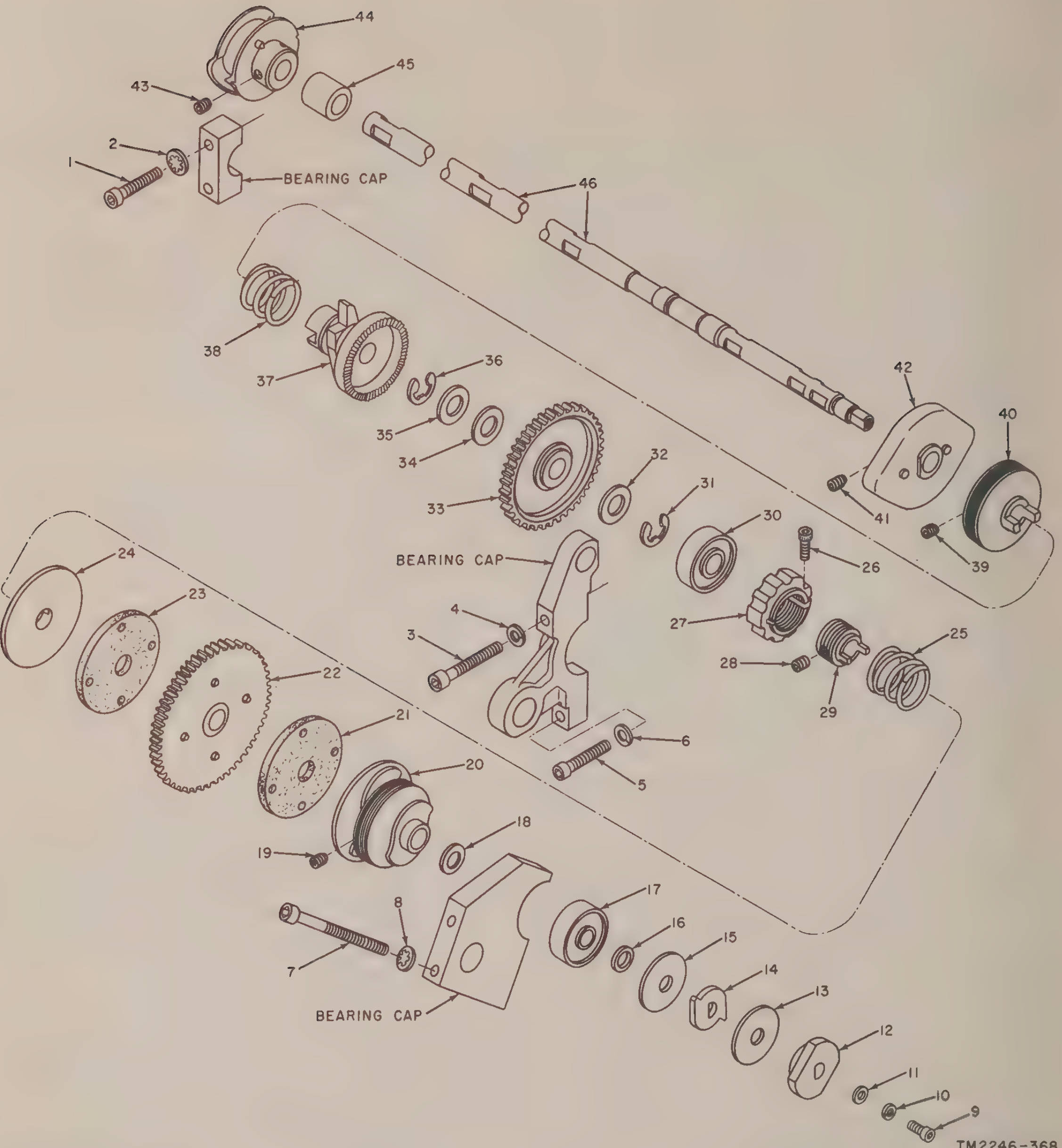
(4) Remove the clamping screw (26) that holds the friction adjusting collar (27) to the driving collar (29); turn off the friction adjusting collar.

(5) Remove the two setscrews (28) that hold the driving collar (29) to the function shaft (46); remove the driving collar.

(6) Remove the ball bearing (30) from the function shaft (46).

(7) Remove the retainer ring (31) that holds the function driven gear (33) to the function shaft (46); remove the flat washer (32), function driven gear, and flat washers (34 and 35) from the function shaft.

(8) Remove the retainer ring (36) that holds the function shaft sliding clutch drum (37) to the function shaft (46); remove



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1	Machine screw, 10011
2	Lockwasher, 10404
3	Machine screw, 10012
4	Lockwasher, 10430
5	Machine screw, 10011
6	Lockwasher, 10430
7	Machine screw, 10014
8	Lockwasher, 10404
9	Machine screw, 10003
10	Lockwasher, 10429
11	Flat washer, 10458
12	Transfer lever restoring cam, 53878
13	Flat washer, 53885
14	Locking bail cam, 53881
15	Flat washer, 53885
16	Flat washer, 51552
17	Ball bearing, 10756
18	Flat washer, 50552
19	Setscrew, 10208
20	Line feed and platen shift sensing cam, 51612
21	Friction plate, 50846
22	Square shaft driving gear, 56274A
23	Friction plate, 56273
24	Friction clutch plate, 54929
25	Clutch pressure spring, 54933
26	Clamping screw, 10052
27	Friction adjusting collar, 54926
28	Setscrew, 10209
29	Driving collar, 54927
30	Ball bearing, 10757
31	Retainer ring, 10959
32	Flat washer, 50515
33	Function driven gear, 50512
34	Flat washer, 51847
35	Flat washer, 50515
36	Retainer ring, 10959
37	Function shaft sliding clutch drum, 50515
38	Clutch spring, 50848
39	Setscrew, 10209
40	Flexible coupling disk, 51167A
41	Setscrew, 10209
42	Print cam, 50753A
43	Setscrew, 10209
44	Function cam, 50752
45	Sleeve bearing, 50852
46	Function shaft, 55522

Figure 229. Function shaft, exploded view.

the function shaft sliding clutch drum and clutch spring (38).

(9) Remove the two setscrews (39) that hold the flexible coupling disk (40) to the function shaft (46); remove the flexible coupling disk.

(10) Remove the two setscrews (41) that hold the print cam (42) to the function shaft (46); remove the print cam.

(11) Remove the two setscrews (43) that hold the function cam (44) to the function shaft (46); remove the function cam.

(12) Remove the sleeve bearing (45) from the function shaft (46).

b. Reassembly.

(1) Install the sleeve bearing (45) on the function shaft (46).

(2) Position the function cam (44) on the function shaft (46); secure with the two setscrews (43).

(3) Position the print cam (42) on the function shaft (46); secure with the two setscrews (41).

(4) Position the flexible coupling disk (40) on the function shaft (46); secure with the two setscrews (39).

(5) Position the clutch spring (38) and the function shaft sliding clutch drum (37) on the function shaft (46) so that the clutch drum engages the flexible coupling disk (40); secure with a retainer ring (36).

(6) Install the two flat washers (35 and 34), the function driven gear (33), and the flat washer (32) on the function shaft (46); secure with a retainer ring (31).

(7) Position the ball bearing (30) on the function shaft (46).

(8) Position the driving collar (29) on the function shaft (46); secure with the two setscrews (28).

(9) Install the friction adjusting collar (27); secure with a machine screw (26).

(10) Position the clutch pressure spring (25) and the friction clutch plate (24) on the function shaft (46) so that the friction clutch plate engages the driving collar (29). Position the friction plate (23), square shaft driving gear (22), friction plate (21), and the line feed and platen shift sensing cam (20) on the function shaft (46); secure the line feed and platen shift sensing cam to the shaft with the two setscrews (19).

(11) Position the flat washer (18), ball bearing (17), flat washer (16), flat washer (15), locking bail cam (14), flat washer (13), and transfer lever restoring can (12) on the function shaft (46); secure with a machine screw (9), lockwasher (10), and flat washer (11).

(12) Install the function shaft on the page printer frame as described in paragraph 194*b*.

196. Disassembly and Reassembly of Selector Camshaft

(fig. 230)

a. Disassembly.

(1) Remove the orientation lever from the rangefinder as described in paragraph 186*a*(3).

(2) Remove the two socket head machine screws (1) and lockwashers (2) that hold the selector camshaft ball bearing (15) to the selector side of the page printer frame.

(3) Remove the main shaft as described in paragraph 197*a*.

(4) Remove the two setscrews (3) that hold the friction clutch disk (6) to the selector camshaft (16).

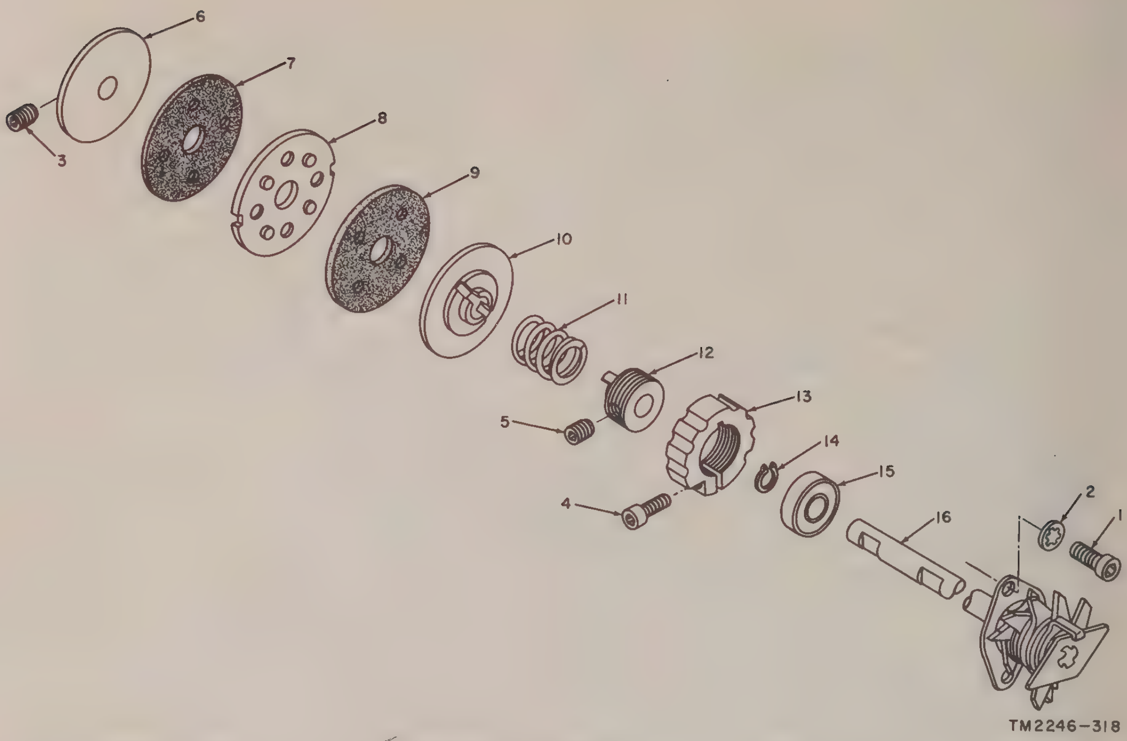
(5) Remove the socket head machine screw (4) that holds the friction clutch adjusting collar (13) to the drive shaft collar (12); turn the friction clutch adjusting collar off the friction clutch drive shaft collar (12) far enough to remove the two setscrews (5) from the drive shaft collar; remove the two setscrews.

(6) Remove the assembled selector camshaft (16) and ball bearing (15) from the printer frame; catch the friction clutch disk (6), friction plate (7), driving disk (8), friction plate (9), friction clutch plate (10), friction clutch spring (11), drive shaft collar (12) and friction clutch adjusting collar (13) as they fall from the selector camshaft.

(7) Remove the retainer ring (14) that holds the ball bearing (15) on the selector camshaft (16); remove the ball bearing.

b. Reassembly.

(1) Position the ball bearing (15) on the selector camshaft (16); secure with the retainer ring (14).



1 Machine screw, 10003
2 Lockwasher, 10403
3 Setscrew, 10209
4 Machine screw, 10052
5 Setscrew, 10208
6 Friction clutch disk, 50200
7 Friction plate, 50013
8 Driving disk, 51117
9 Friction plate, 50013
10 Friction clutch plate, 54931
11 Friction clutch spring, 54932
12 Drive shaft collar, 54928
13 Friction clutch adjusting collar, 54926
14 Retainer ring, 10462
15 Ball bearing, 10753
16 Selector camshaft, 50125A

Figure 230. Selector camshaft, exploded view.

(2) Insert the selector camshaft (16) in the opening in the page printer frame; install the friction clutch adjusting collar (13), drive shaft collar (12), friction clutch spring (11), friction clutch plate (10), friction plate (9), driving disk (8), friction plate (7), and friction clutch disk (6) on the selector camshaft.

(3) Position the bearing retainer on the printer frame; secure with the two socket head machine screws (1) and lockwashers (2).

(4) Position the friction clutch drive shaft collar (12) on the selector cam shaft (16) so that the holes in the collar line up with the flats on the selector camshaft; secure with the two setscrews (5).

(5) Install the main shaft as described in paragraph 197*b*.

(6) Position the friction clutch disk (6) on the selector camshaft (16) so that the holes in the disk line up with the flats on the selector camshaft; secure with the two setscrews (3).

(7) Turn the friction clutch adjusting collar (13) on the drive shaft collar (12); adjust as described in paragraph 329, and tighten the socket head machine screw (4) to lock the adjustment.

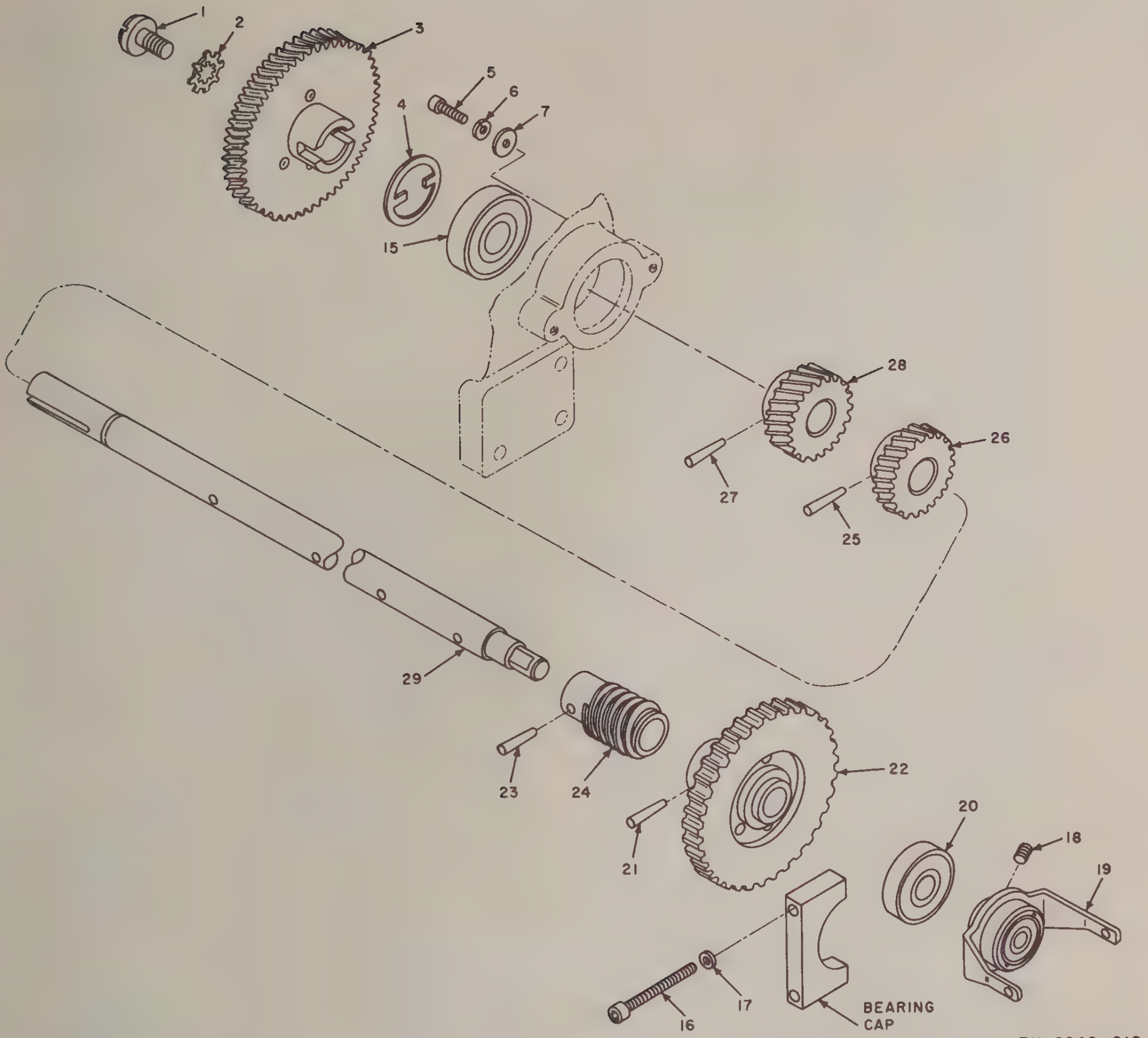
(8) Install the orientation lever on the rangefinder as described in paragraph 186*b*(5).

197. Removal and Replacement of Main Shaft

(fig. 231)

a. Removal.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.



1 Machine screw, 50207
2 Lockwasher, 10406
3 Main shaft driven gear, 50352A
~~4~~ Drive key, 54566
5 Machine screw, 10003
6 Lockwasher, 10429
~~7~~ Flat washer 10450
15 Ball bearing, 10758
16 Machine screw, 10012
17 Lockwasher, 10430
18 Setscrew, 10209
~~19~~ Selector friction clutch fork, 50484A
~~20~~ Ball bearing, 10757
21 Taper pin 10852
22 Function shaft driving gear, 50354A
23 Taper pin, 10850
~~24~~ Carriage feed worm gear, 50268
25 Taper pin 10852
26 Carriage-return shaft drive gear, 55167
27 Taper pin 10852
28 Transmitter shaft drive gear, 55166
29 Main shaft, 54563

Figure 231. Page printer main shaft, exploded view.

(2) Remove the gear cover, worm gear bracket, and gasket from the page printer frame as described in paragraph 168*a*(2).

(3) Remove the machine screw (1, fig. 231) and lockwasher (2) that hold the main shaft driven gear (3) to the main shaft (29). Loosen the four motor mounting screws and remove the main shaft driven gear.

(4) Remove the five drive keys (4) from the main shaft driven gear.

(5) Remove the two machine screws (5), lockwashers (6), and flat washers (7) that hold the ball bearing (15) into the page

printer frame. Remove the ball bearing.

(6) Remove the two machine screws (16) and lockwashers (17) that hold the bearing cap to the printer frame; remove the bearing cap.

(7) Remove the rangefinder orientation lever (10, fig. 221) from the rangefinder mechanism as described in paragraph 186*a* (3).

(8) Remove the two socket head screws (1, fig. 230) and lockwashers (2) that hold the selector camshaft (16) to the printer frame; pull the selector camshaft out of the frame far enough to allow the selector friction clutch fork (19, fig. 231) to clear the driving disk (8, fig. 230) on the selector camshaft.

(9) With the function shaft in the stop position, remove the main shaft (29, fig. 231) by turning the shaft as it is moved toward the rear of the page printer.

b. Replacement.

(1) Position the left end of the main shaft (29, fig. 231) in the hole in the function side of the printer frame.

(2) Position the ball bearing (20) in the bearing seat in the selector side of the frame. Position the bearing cap on the bearing and on the frame; secure with the two socket head machine screws (16) and lockwashers (17).

(3) Install the ball bearing (15) on the function side of the main shaft (29) and in the bearing seat in the printer frame; secure with the two machine screws (5), lockwashers (6), and flat washers (7).

(4) Position the five drive keys (4) on the main shaft driven gear (3).

(5) Install the main shaft driven gear (3) on the main shaft (29); secure with a machine screw (1) and lock washer (2).

Note. Be sure to install the correct gear for the operating speed desired (par. 29). Be sure the mating gear is marked for the same speed (par. 169).

(6) Install the rangefinder orientation lever (10, fig. 234) on the rangefinder mechanism as described in paragraph 186*b*.

(7) Move the selector camshaft (16, fig. 230) in so that the driving disk (8) of the friction clutch engages the selector friction clutch fork (19, fig. 231) on the main shaft (29).

(8) Install the two socket head machine screws (1, fig. 230) and lockwashers (2) that hold the selector camshaft (16) to the selector side of the printer frame.

(9) Install the gasket, gear cover, and worm gear bracket on the printer frame as described in paragraph 168*b*(3).

(10) Install the page printer on the printer base as described in paragraph 152*b*.

198. Disassembly and Reassembly of Main Shaft

(fig. 231)

a. Disassembly.

(1) Remove the main shaft as described in paragraph 197*a*.

(2) Remove the two setscrews (18) that hold the selector friction clutch fork (19) to the main shaft (29); remove the clutch fork.

(3) Remove the ball bearing (20) from the main shaft.

(4) Drive out the taper pin (21) that holds the function shaft driving gear (22) to the main shaft; remove the function shaft driving gear.

(5) Drive out the taper pin (23) that holds the carriage feed worm gear (24); remove the worm gear from the main shaft (29).

(6) Drive out the taper pin (25) that holds the carriage return shaft drive gear (26) to the main shaft (29); remove the carriage return shaft drive gear.

(7) Remove the taper pin (27) that holds the transmitter shaft drive gear (28) to the main shaft (29); remove the transmitter shaft drive gear.

b. Reassembly.

(1) Position the transmitter shaft drive gear (28) on the main shaft (29); secure with a taper pin (27).

(2) Position the carriage-return shaft drive gear (26) on the main shaft (29); secure with a taper pin (25).

(3) Position the carriage-feed worm gear (24) on the main shaft (29); secure with a taper pin (23).

(4) Position the function shaft driving gear (22) on the main shaft (29); secure with a taper pin (21).

(5) Position the ball bearing (20) on the main shaft (29).

(6) Position the selector friction clutch fork (19) on the main shaft (29); secure with the two setscrews (18).

(7) Install the main shaft as described in paragraph 197*b*.

199. Removal and Replacement of Code-Ring Cage

a. Removal.

(1) Remove the two machine screws (1, fig. 232) and lockwashers (2) that hold the code-ring cage to the selector side of the page printer frame.

(2) Remove the four setscrews (10, fig. 228) that hold the stop arm shaft (5, fig. 232) to the square shaft driven gear (11, fig. 228); remove the assembled stop arm shaft and stop arm (4, fig. 232).

(3) Remove the three machine screws (6), flat washers (7), and lockwashers (8) that hold the two line feed carriage return stop bar adjustable fulcrums (9), the figures stop bar adjustable fulcrum (10), and the bracket (13) to the function stop bar support guide (15): remove the three fulcrums and the bracket.

(4) Remove the code-ring cage by pulling it away from the page printer casting.

b. Replacement.

(1) Position the code-ring cage on the selector side of the page printer frame.

(2) Position the two line feed carriage-return stop bar adjustable fulcrums (9), the figures stop bar adjustable fulcrum (10), and the bracket (13) on the code-ring cage; secure with the three machine screws (6), flat washers (7), and lockwashers (8).

(3) Insert the stop arm shaft (5) in the opening in the center of the code-ring cage and in the hole in the square shaft driven gear (11, fig. 228); secure the stop arm shaft to the gear with the four setscrews (10).

(4) Install the two machine screws (1, fig. 232) and lockwashers (2) that hold the code-ring cage to the selector side of the page printer frame.

(5) Adjust the code-ring cage as described in paragraphs 302, 308, 309, 316, 330, 331, and 332.

200. Disassembly and Reassembly of Code-Ring Cage

(fig. 232).

a. Disassembly.

(1) Remove the code-ring cage from the page printer as described in paragraph 199*a*.

(2) Remove the machine screw (3) that holds the square shaft stop arm (4) to the stop arm shaft (5); remove the square shaft stop arm.

(3) Remove the three self-locking hexagonal nuts (11) that hold the three eccentric studs (12) to the bracket (13); remove the eccentric studs.

(4) Remove the two dowels (14) from the function stop bar support guide (15) and from the code-bar cage plate (57); remove the function stop bar support guide.

(5) Remove the three machine screws (16) and lockwashers (17) that hold the retainer plate (18) to the code-bar cage plate (57); remove the retainer plate.

(6) Remove the locking bail spring (19) from the code-ring locking bail (23) and from the code-bar cage plate (57).

(7) Remove the two machine screws (20), flat washers (21), and lockwashers (22), that hold the code-ring locking bail (23) to the code-ring locking bail shaft (26); remove the code-ring locking bail.

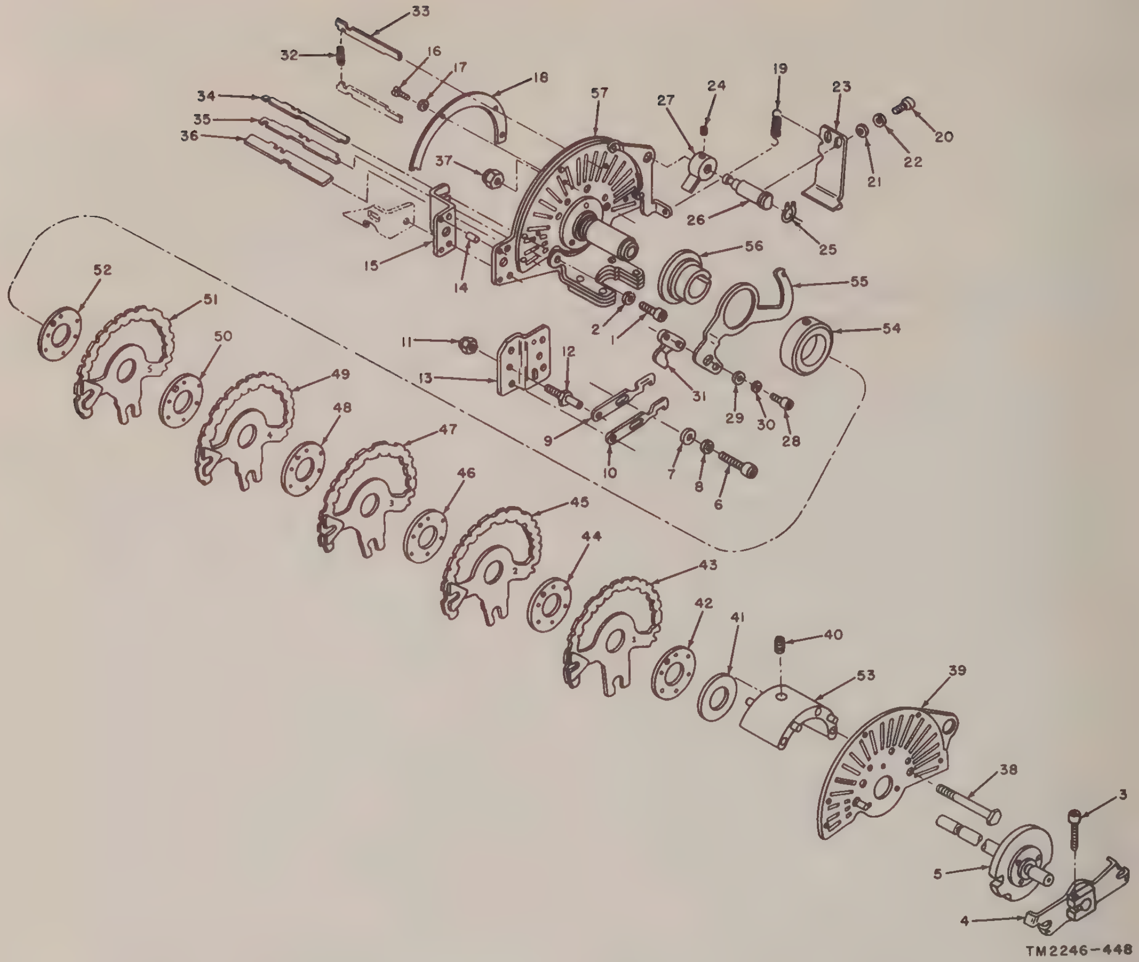
(8) Remove the two setscrews (24) that hold the code-ring locking lever (27) to the code-ring locking bail shaft (26).

(9) Remove the retainer ring (25) that holds the code-ring locking bail shaft (26) to the code-ring cage. Remove the code-ring locking bail shaft; catch the code-ring locking lever (27) as it falls off of the shaft.

(10) Remove the machine screw (28), flat washer (29), and lockwasher (30) that hold the cam follower (31) to the code-ring cam follower locking lever (55); remove the cam follower.

(11) Remove the 19 stop bar springs (32) from the stop bars (33) in the code-ring cage; remove the 32 stop bars, the line feed stop bar (34), carriage-return stop bar (35), and the figures stop bar (36).

(12) Remove the three self-locking hexagonal nuts (37) and cage tie bolts (38) that hold



1 Machine screw, 10024
2 Lockwasher, 10431
3 Machine screw, 10009
4 Square shaft stop arm, 53802A (includes item 3)
5 Stop arm shaft, 50377A
6 Machine screw, 10005
7 Flat washer, 10458
8 Lockwasher, 10429
9 Line feed carriage-return stop bar adjustable fulcrum, 56178
10 Figures stop bar adjustable fulcrum, 56176
11 Self-locking hexagonal nut, 10500
12 Eccentric stud, 55738
13 Bracket, 55737
14 Dowel, 50458
15 Function stop bar support guide, 52964
16 Machine screw, 10317
17 Lockwasher, 10433
18 Retainer plate, 56177
19 Locking bail spring, 50941
20 Machine screw, 10004
21 Flat washer, 10459
22 Lockwasher, 10429
23 Code-ring locking bail, 53884
24 Set screw, 10201
25 Retainer ring, 10451
26 Code-ring locking bail shaft, 53871
27 Code-ring locking lever, 53875A
28 Machine screw, 10001
29 Flat washer, 10459
30 Lockwasher, 10429
31 Cam follower, 53882
32 Stop bar spring, 52940
33 Stop bar, 50502
34 Line feed stop bar, 52959
35 Carriage return stop bar, 52961
36 Figures stop bar, 56179
37 Self-locking hexagon nut, 10500
38 Cage tie bolt, 53772
39 Code cage outside guide, 53809A (includes items 53 and 57)
40 Set screw, 10223
41 Flat washer, 53453
42 Ball retainer, 53647A
43 Code ring, 53641
44 Ball retainer, 53647A
45 Code ring, 53642
46 Ball retainer, 53647A
47 Code ring, 53643
48 Ball retainer, 53647A
49 Code ring, 53644
50 Ball retainer, 53647A
51 Code-ring, 53645
52 Ball retainer, 53647A
53 Code cage spacer
54 Code ring collar, 53868
55 Code-ring cam follower locking lever, 53869
56 Sleeve bearing, 53867
57 Code bar cage plate

Figure 232. Code-ring cage, exploded view.

the code cage outside guide (39) to the code-bar cage plate (57); remove the code cage outside guide.

(13) Remove the setscrew (40) that holds the code cage spacer (53) to the code-ring collar (54).

(14) Remove the flat washer (41) from the stud on the code bar-cage plate. Remove the six ball retainers (42, 44, 46, 48, 50, and 52) and the five code-rings (43, 45, 47, 49, and 51) from the stud on the code-bar cage plate, alternately remove a ball retainer and a code-ring until all are removed.

(15) Remove the code cage spacer (53) from the code-bar cage plate (57).

(16) Remove the code-ring collar (54), code-ring cam follower locking lever (55), and the sleeve bearing (56) from the code-bar cage plate (57).

b. Reassembly.

(1) Install the sleeve bearing (56), code-ring cam follower locking lever (55), and code-ring collar (54) on the stud on the code-bar cage plate (57).

(2) Install the code cage spacer (53) on the code-ring guide plate.

(3) Install the six ball retainers (52, 50, 48, 46, 44, and 42) and the five code-rings (51, 49, 47, 45, and 43) on the stud on the code bar cage plate (57), alternate a ball retainer and a code ring and, starting with a ball retainer and number 5 code ring, install the code rings in descending numerical order. Install the flat washer (41).

(4) Install the setscrew (40) that holds the code cage spacer (53) to the code-ring collar (54).

(5) Position the code cage outside guide (39) on the code cage spacer (53) and on the code bar cage plate (57); secure with three cage tie bolts (38) and self-locking hexagonal nuts (37).

(6) Install the 32 stop bars (33) and 16 stop bar springs (32); position the stop bars in pairs and install one spring for each pair of stop bars. Install the line feed stop bar (34), carriage-return stop bar (35), figures stop bar (36), and three springs.

(7) Position the cam follower (31) on the code-ring cam follower locking lever (55); secure with a machine screw (28), lock washer (30), and flat washer (29).

(8) Insert the code-ring locking bail shaft (26) part of the way into the hole in the code cage outside guide (39); install the code-ring locking lever (27) on the shaft so that the blade of the code-ring locking lever engages the notch in the code-ring cam follower locking lever (55). Position the code-ring locking bail shaft on the code-ring cage; secure with a retainer ring (25).

(9) Install the two setscrews (24) in the collar of the code-ring locking lever (27), lock the lever to the code-ring locking bail shaft (26).

(10) Position the code-ring locking bail (23) on the code-ring locking bail shaft (26); secure with the two machine screws (20), lockwashers (22) and flat washers (21).

(11) Install the locking bail spring (19) on the code-ring locking bail (23) and on the code bar cage plate (57).

(12) Position the retainer plate (18) on the code bar cage plate (57); secure with the three machine screws (16) and lockwashers (17).

(13) Position the two dowels (14) in the function stop bar support guide (15) and in the code bar cage plate (57).

(14) Position the three eccentric studs (12) on the bracket (13); secure with the three self-locking hexagonal nuts (11).

(15) Position the square shaft stop arm (4) on the stop arm shaft (5); secure with a machine screw (3).

(16) Install the code-ring cage on the page printer as described in paragraph 199*b*.

201. Disassembly and Reassembly of Function Sensing Lever Group

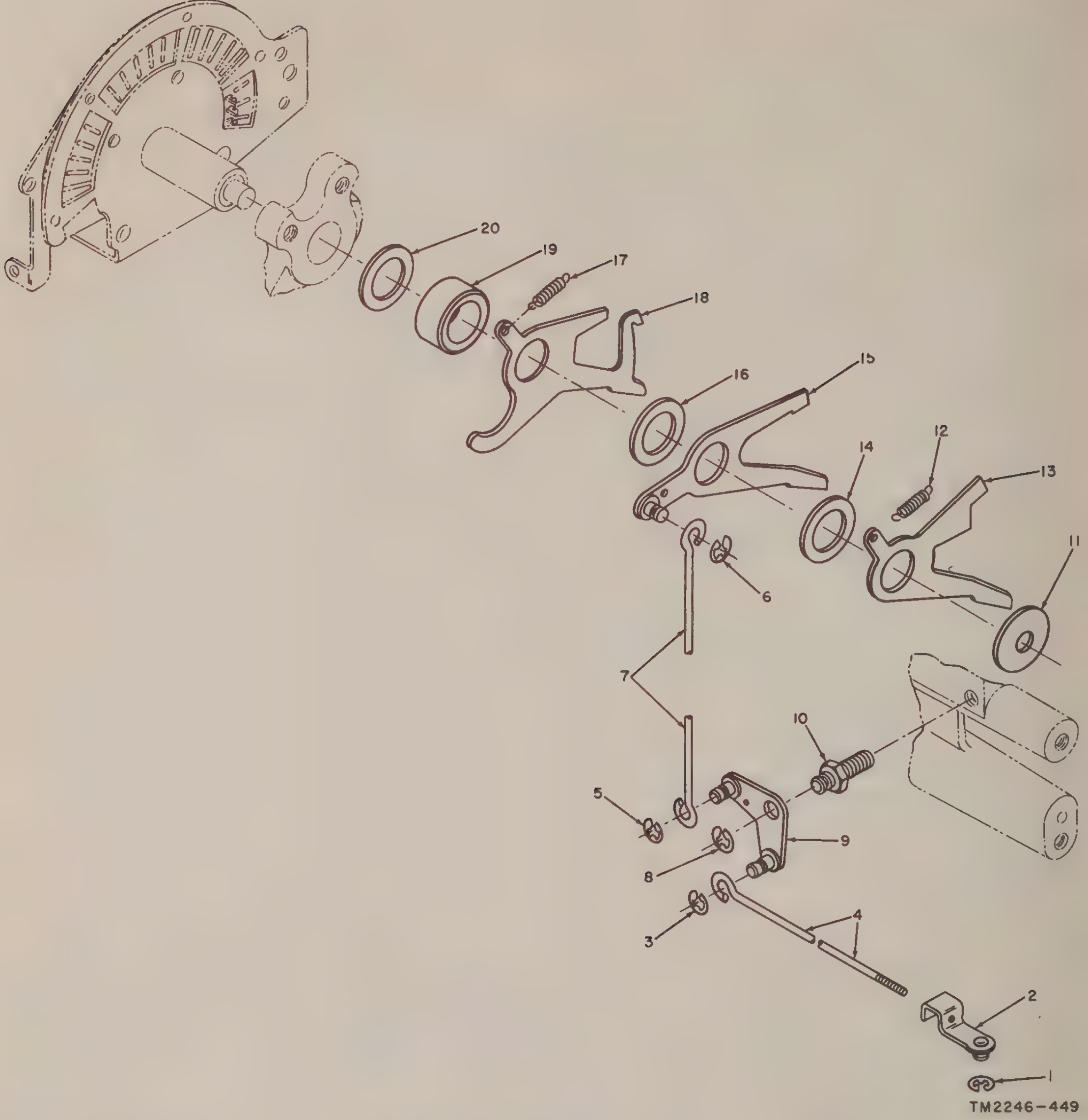
(fig. 233)

a. Disassembly.

(1) Remove the square shaft as described in paragraph 193*a*.

(2) Remove the line feed and the platen shift mechanism as described in paragraph 192*a*.

(3) Remove the retainer ring (1) from the pivot stud on the connector link (2); remove the connector link from engagement with the double blocking lever.



1 Retainer ring, 10960
2 Connector link, 53161A
3 Retainer ring, 10960
4 Horizontal carriage return link, 50864
5 Retainer ring, 10960
6 Retainer ring, 10960
7 Vertical carriage-return link, 50483
8 Retainer ring, 10948
9 Carriage-return bell crank, 52121A
10 Carriage-return bell crank pivot, 52552
11 Flat washer, 50374
12 Line feed sensing lever spring, 51754
13 Line feed sensing lever, 53106
14 Flat washer, 50384
15 Carriage return sensing lever, 52659A
16 Flat washer, 50384
17 Figure shift sensing lever spring, 51754
18 Figure shift sensing lever, 52749
19 Spacing collar, 50505
20 Tolerance takeup flat washer, 51100

Figure 233. Function sensing lever group, exploded view.

(4) Remove the retainer ring (3) from the pivot stud on the carriage-return bell crank (9); remove the horizontal carriage-return link (4) from the stud.

(5) Remove the retainer rings (5 and 6) from the pivot studs; remove the vertical carriage-return link (7) from the pivot studs.

(6) Remove the retainer ring (8) from the carriage-return bell crank pivot (10); remove the carriage-return bell crank (9) from the carriage-return bell crank pivot.

(7) Remove the carriage-return bell crank pivot (10).

(8) Remove the flat washer (11) from the stop arm shaft.

(9) Remove the line feed sensing lever spring (12) from the line feed sensing lever (13) and from the bell crank pivot bracket.

(10) Remove the line feed sensing lever (13) from the stop arm shaft.

(11) Remove the flat washer (14), carriage-return sensing lever (15), and flat washer (16).

(12) Remove the figure S-shift sensing lever spring (17) from the figure S-shift sensing lever (18) and from the bell crank pivot bracket.

(13) Remove the figure S-shift sensing lever (18), spacing collar (19), and tolerance takeup flat washer (20) from the stop arm shaft.

b. Reassembly.

(1) Place the tolerance takeup flat washer (20), spacing collar (19), and figure S-shift sensing lever (18) on the stop arm shaft.

(2) Install the figure S-shift sensing lever spring (17) on the figure S-shift sensing lever (18) and on the bell crank pivot bracket.

(3) Place the flat washer (16), carriage-return sensing lever (15), flat washer (14), and line feed sensing lever (13) on the stop arm shaft.

(4) Install the line feed sensing lever spring (12) on the line feed sensing lever (13) and on the bell crank pivot bracket.

(5) Install the flat washer (11) on the shaft.

(6) Install the carriage-return bell crank pivot (10) on the frame of the machine.

(7) Position the carriage-return bell crank (9) on the carriage-return bell crank pivot (10); hold with a retainer ring (8).

(8) Position the vertical carriage-return link (7) on the pivot studs on the carriage-return bell crank (9) and on the carriage-return sensing lever (15); hold the link on the pivot studs with the retainer rings (5) and (6).

(9) Position the horizontal carriage-return link (4) on the remaining pivot stud on the carriage-return bell crank (9); hold with a retainer ring (3).

(10) Install the connector link (2) on the horizontal carriage-return link (4); adjust the length of the horizontal carriage-return link as described in paragraphs 303 and 304.

(11) Position the pivot stud of the connector link (2) in the hole in the double blocking lever; hold in place with a retainer ring (1).

(12) Install the line feed and the platen shift as described in paragraph 192*b*.

(13) Install the square shaft as described in paragraph 193*b*.

202. Disassembly and Reassembly of Manual Unshift Mechanism

(fig. 234)

a. Disassembly.

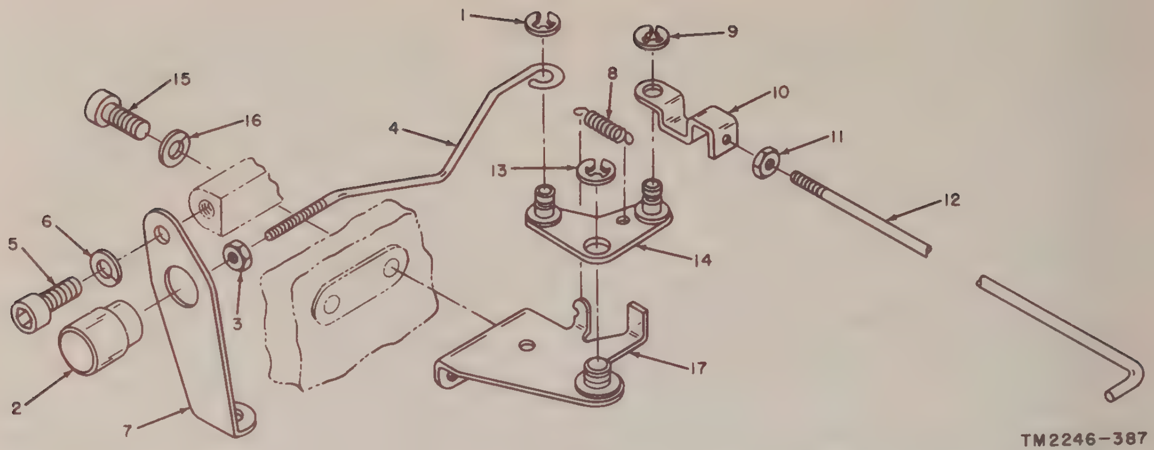
(1) Remove the retainer ring (1) that holds the manual unshift pushbutton link (4) to the manual unshift bell crank (14); remove the assembled link (4) and manual unshift pushbutton (2).

(2) Remove the manual unshift pushbutton (2) and plain hexagonal nut (3) from the manual unshift pushbutton link.

(3) Remove the two machine screws (5) and lockwashers (6) that hold the manual unshift pushbutton bracket mounting plate (7) to the page printer frame; remove the manual unshift pushbutton bracket mounting plate.

(4) Remove the manual unshift bell crank spring (8) from manual unshift bell crank (14) and from bell crank mounting bracket (17).

(5) Remove the retainer ring (9) that holds the connector link (10) to manual unshift bell crank (14). Remove the connector link and plain hexagonal nut (11) from



1 Retainer ring, 10960
2 Unshift pushbutton, 55513
3 Plain hexagonal nut, 10520
4 Manual unshift pushbutton link, 53413
5 Machine screw, 10008
6 Lockwasher, 10430
7 Manual unshift pushbutton bracket mounting plate, 56211
8 Manual unshift bell crank spring, 50916
9 Retainer ring, 10960
10 Connector link, 51783
11 Plain hexagonal nut, 10520
12 Manual unshift lever link, 56267
13 Retainer ring, 10949
14 Manual unshift bell crank, 52121A
15 Machine screw, 10025
16 Lockwasher, 10430
17 Bell crank mounting bracket, 53415A

Figure 234. Manual unshift mechanism, exploded view.

manual unshift lever link (12); remove the manual unshift lever link by pulling it through the opening in the function side of the page printer frame.

(6) Remove the retainer ring (13) that holds the manual unshift bell crank (14) to bell crank mounting bracket (17); remove the manual unshift bell crank.

(7) Remove the two machine screws (15) and lockwashers (16) that hold bell crank mounting bracket (17) to the selector side of the page printer frame; remove the bell crank mounting bracket.

b. Reassembly.

(1) Position the bell crank mounting bracket (17) on the selector side of the page printer frame; secure with the two machine screws (15) and lockwashers (16).

(2) Position the manual unshift bell crank (14) on bell crank mounting bracket (17); secure with a retainer ring (13).

(3) Insert the manual unshift lever link (12) through the function side of the page printer frame. Install the plain hexagonal nut (11) and connector link (10) on the manual unshift lever link. Position the connector link on the manual unshift bell crank (17); secure with a retainer ring (9).

(4) Install the manual unshift bell crank spring (8) on manual unshift bell crank (14) and on the bell crank mounting bracket (17).

(5) Position the manual unshift pushbutton bracket mounting plate (7) on the page printer frame; secure with the two machine screws (5) and lockwashers (6).

(6) Install the plain hexagonal nut (3) and manual unshift pushbutton (2) on the manual unshift pushbutton link (4).

(7) Position the manual unshift push button link (4) through the hole in the manual unshift push button bracket mounting plate (7) and on the manual unshift bell crank (14); secure with a retainer ring (1).

(8) Adjust the manual unshift mechanism as described in paragraph 368.

203. Disassembly and Reassembly of Manual Space Mechanism

a. Disassembly.

(1) Remove E-ring 10960 (fig. 235) that holds link 55506 to manual space bell crank 55510A.

(2) Remove the stud that holds bracket 55503 to the function side of the page printer frame as described in paragraph 204*a*.

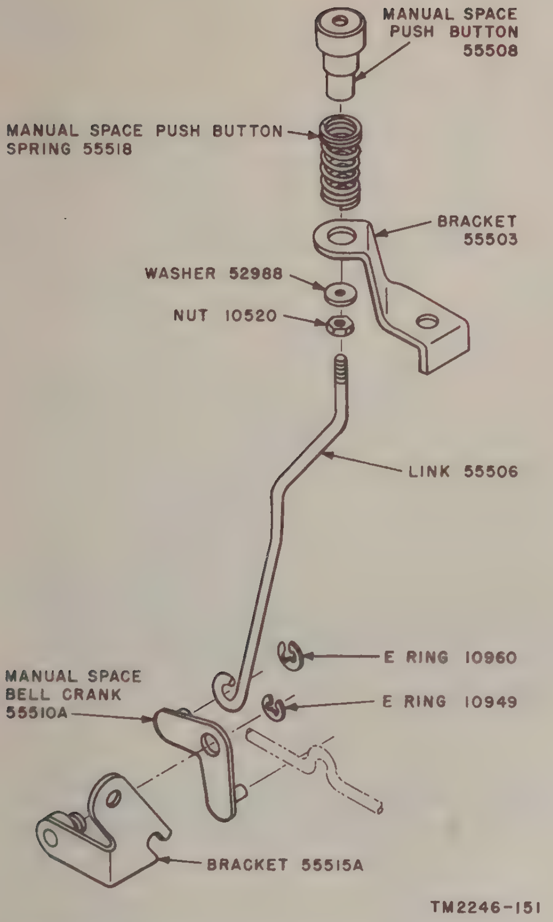

MANUAL SPACE PUSH BUTTON 55508
MANUAL SPACE PUSH BUTTON SPRING 55518
BRACKET 55503
WASHER 52988
NUT 10520
LINK 55506
E RING 10960
MANUAL SPACE BELL CRANK 55510A
E RING 10949
BRACKET 55515A
TM2246-151

Figure 235. Manual space mechanism, exploded view.

(1) through (3). Remove the assembled push button and link.

(3) Remove manual space push button 55508 from link 55506; remove manual space push button spring 55518, bracket 55503, and washer 52988.

(4) Remove nut 10520 from link 55506.

(5) Remove E-ring 10949 that holds manual space bell crank 55510A to bracket 55515A; remove manual space bell crank 55510A.

(6) Remove the self-locking hexagonal nut (1, fig. 226) that holds bracket 55515A (fig. 235) to the page printer frame; remove bracket 55515A.

b. Reassembly.

(1) Position bracket 55515A (fig. 235) on the page printer frame; secure with a self-locking hexagonal nut (1, fig. 226).

(2) Position manual space bell crank 55510A on bracket 55515A; secure with E-ring 10949.

(3) Install nut 10520 on link 55506.

(4) Install washer 52988, bracket 55503, manual space push button spring 55518, and manual space push button 55508 on link 55506.

(5) Position bracket 55503 on the page printer frame; secure with a stud as described in paragraph 204*b*(6) through (9).

(6) Position link 55506 on manual space bell crank 55510A; secure with E-ring 10949.

(7) Adjust the manual space mechanism as described in paragraph 350.

204. Disassembly and Reassembly of Automatic Carriage-Return Mechanism

(fig. 236)

a. Disassembly.

(1) Remove the retainer ring (1) that holds the automatic carriage-return link connector link (5) to the stop bar shift lever (3).

(2) Remove the retainer ring (2) that holds the stop bar shift lever (3) to the stud (4); remove the stop bar shift lever.

(3) Remove the stud (4) from the function side of the page printer frame.

(4) Remove the connector link (5) from the stop bar shift link (9).

(5) Remove the setscrew (6) that holds the spring collar (13) on the stop bar shift link (9).

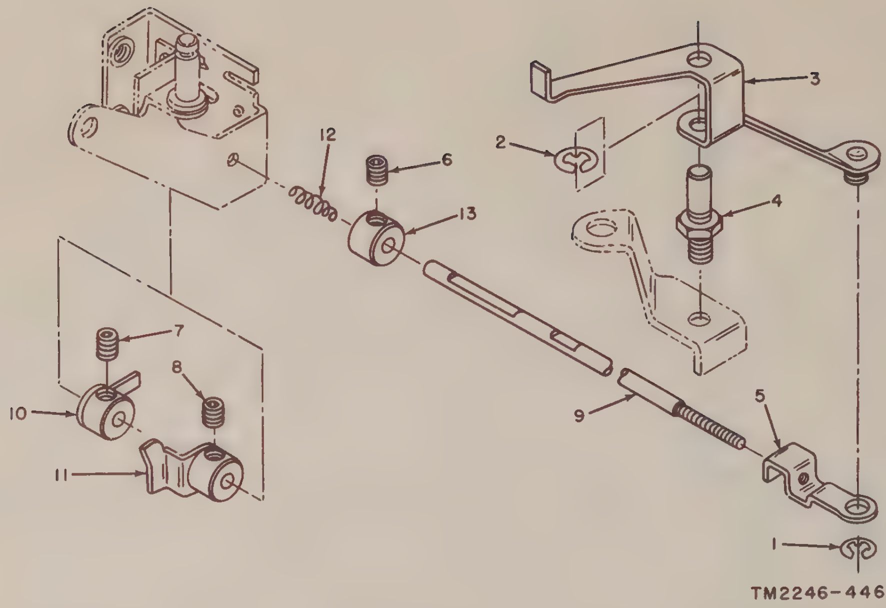
(6) Remove the setscrew (8) that holds the stop bar shift blade (11) to the stop bar shift link (9).

(7) Remove the setscrew (7) that holds the stop bar shift stop (10) to the stop bar shift link (9).

(8) Remove the stop bar shift link (9) by moving it toward the function side of the page printer. Catch the stop bar shift stop (10) and stop bar shift blade (11) as they fall from the link. Remove the stop bar return spring (12) and spring collar (13) from the link.

b. Reassembly.

(1) Position the spring collar (13) and the stop bar return spring (12) on the stop bar shift link (9). Insert the end of the link into the hole on the stop bar shift link bracket at the selector side of the



1 Retainer ring, 10960
2 Retainer ring, 10949
3 Stop bar shift lever, 52945A
4 Stud, 52948
5 Connector link, 51783
6 Setscrew, 10201
7 Setscrew, 10201
8 Setscrew, 10201
9 Stop bar shift link, 55733
10 Stop bar shift stop, 55740A
11 Stop bar shift blade, 55735A
12 Stop bar return spring, 52953
13 Spring collar, 55736

Figure 236. Automatic carriage-return mechanism, exploded view.

page printer. Slide the stop bar shift blade (11) and the stop bar shift stop (10) into position on the stop bar shift link.

(2) Install the setscrew (7) to secure the stop bar shift stop (10) to the stop bar shift link (9).

(3) Install the setscrew (8) to secure the stop bar shift blade (11) to the stop bar shift link.

(4) Install the setscrew (6) to secure the spring collar to the stop bar shift link (9).

(5) Install the connector link (5) on the stop bar shift link (9).

(6) Install the stud (4) on the function side of the page printer frame.

(7) Position the stop bar shift lever (3) on the stud (4); secure with a retainer ring (2).

(8) Position the connector link (5) on the stud on the stop bar shift lever (3); secure with a retainer ring (1).

(9) Adjust the automatic carriage-return mechanism as described in paragraphs 381, 382, and 383.

205. Disassembly and Reassembly of Manual Carriage-Return Button Mechanism

(fig. 237)

a. Disassembly.

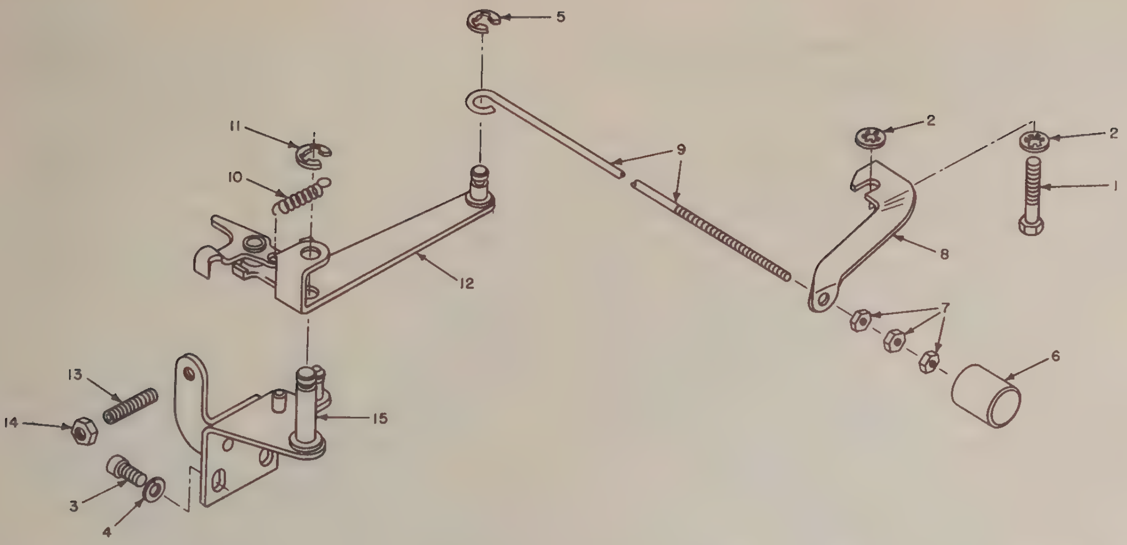
(1) Remove the machine screw (1) and two lockwashers (2) that hold the carriage-return button bracket (8) to the page printer frame.

(2) Remove the two machine screws (3) and lockwashers (4) that hold the manual carriage return bracket (15) to the page printer frame; remove the manual carriage-return button mechanism.

(3) Remove the retainer ring (5) that holds the carriage-return button link (9) to the manual carriage-return lever (12); remove the assembled manual carriage-return button (6) and link (9).

(4) Remove the manual carriage-return push button (6) from the carriage-return button link (9).

(5) Remove the three plain hexagonal nuts (7) from the carriage-return button link (9); remove the carriage-return button bracket (8).



1	Machine screw, 10320
2	Lockwasher, 10404
3	Machine screw, 10008
4	Lockwasher, 10430
5	Retainer ring, 10960
6	Manual carriage-return button, 55513
7	Plain hexagonal nut, 10520
8	Carriage-return button bracket, 55514
9	Carriage-return button link, 55517
10	Trip pawl spring, 50196
11	Retainer ring, 10949
12	Manual carriage-return lever, 52791A.
13	Adjusting screw, 10206
14	Plain hexagonal nut, 10505
15	Manual carriage-return bracket, 52790A

Figure 237. Manual carriage-return button mechanism, exploded view.

(6) Remove the trip pawl spring (10) from the spring post on the manual carriage-return bracket (15) and from the manual carriage-return lever (12).

(7) Remove the retainer ring (11) that holds the manual carriage-return lever (12) to the manual carriage-return bracket (15); remove the manual carriage-return lever.

(8) Remove the adjusting screw (13) and plain hexagonal nut (14) from manual carriage-return bracket (15); remove the plain hexagonal nut from the adjusting screw.

b. Reassembly.

(1) Install the plain hexagonal nut (14) on the adjusting screw (13); install the assembled plain hexagonal nut and adjusting screw on the manual carriage-return bracket (15).

(2) Position the manual carriage-return lever (12) on the manual carriage-return bracket (15); secure with a retainer ring (11).

(3) Install the trip pawl spring (10) on the manual carriage-return lever (12) and on the manual carriage-return bracket (15).

(4) Install the carriage-return button bracket (8) and the three plain hexagonal nuts (7) on the carriage-return button link (9).

(5) Install the manual carriage-return button (6) on the carriage-return button link (9).

(6) Position the carriage-return button link (9) on the manual carriage-return lever (12); secure with a retainer ring (5).

(7) Position the manual carriage-return bracket (15) on the page printer frame; secure with the two machine screws (3) and lockwashers (4).

(8) Position the manual carriage-return bracket (15) on the page printer frame; secure with a machine screw (1) and two lockwashers (2).

(9) Adjust the manual carriage-return mechanism as described in paragraphs 347 and 348.

206. Disassembly and Reassembly of Carriage Feed Mechanism

(fig. 238)

a. Disassembly.

(1) Remove the retainer ring that holds carriage feed link (3) to the carriage-feed lever; remove the carriage-feed link from the carriage feed lever.

(2) Remove retainer ring (1) that holds connector link (2) to the carriage feed pawl (9); remove the assembled carriage-feed link (3) and connector link. Remove the connector link from the carriage-feed link.

(3) Remove spring (4) that connects carriage-feed pawl (9) to the spring stud on the page printer frame.

(4) Remove the two machine screws (5) and lockwashers (6) that hold the space pawl mounting bracket (11) to the page printer frame; remove the assembled space pawl mounting bracket and carriage feed pawl (9).

(5) Remove the self-locking hexagonal nut (7) and flat washer (8) that hold carriage feed pawl (9) to space pawl mounting bracket (11); remove the carriage-feed pawl and space pawl flat washer (10).

(6) Remove carriage feed clutch lever spring (12) that connects carriage feed clutch lever (14) to the spring post on the page printer frame.

(7) Remove retainer ring (13) that holds carriage feed clutch lever (14) to the carriage feed clutch lever pivot stud (16); remove the carriage feed clutch lever.

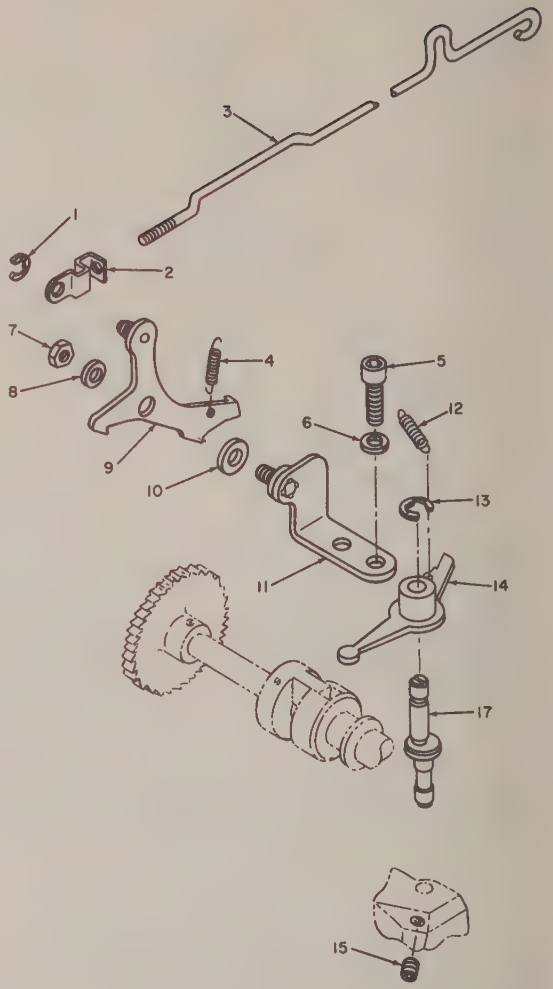
(8) Remove setscrew (15) that holds carriage feed clutch lever pivot stud (16) to the page printer frame; remove the space feed clutch lever pivot stud.

b. Reassembly.

(1) Position the carriage feed clutch lever pivot stud (16) in the drilled hole in the page printer frame; secure with a setscrew (15).

(2) Position the carriage feed clutch lever (14) on the carriage feed clutch lever pivot stud (16); secure with a retainer ring (13).

(3) Install the carriage feed clutch lever spring (12) on the spring post on the page printer frame and on the carriage feed clutch lever (14).



TM2246-443

1	Retainer ring, 10960
2	Connector link, 51783
3	Carriage feed link, 55504
4	Carriage feed pawl spring, 50912
5	Machine screw, 10025
6	Lockwasher, 10430
7	Self-locking hexagonal nut, 10500
8	Flat washer, 10450
9	Carriage feed pawl, 54490A
10	Space pawl flat washer, 50827
11	Space pawl mounting bracket, 55788A
12	Carriage-feed clutch lever spring, 50911
13	Retainer ring, 10949
14	Carriage-feed clutch lever, 50005A
15	Setscrew, 10204
17	Stud, 52318

Figure 238. Carriage feed mechanism, exploded view.

(4) Position the space pawl flat washer (10) and the carriage feed pawl (9) on the space pawl mounting bracket (11); secure with a flat washer (8) and a self-locking hexagonal nut (7).

(5) Position the assembled space pawl bracket (11) and carriage feed pawl (9) on the page printer frame; secure with the two machine screws (5) and lockwashers (6).

(6) Install the carriage feed pawl spring (4) on the carriage feed pawl (9) and on the spring post on the page printer frame.

(7) Install the connector link (2) on the carriage feed link (3). Position the connector link on the carriage feed pawl (9); secure with a retainer ring (1).

(8) Position the other end of the carriage feed link (3) on the carriage feed lever; secure with a retainer ring.

(9) Adjust the carriage feed mechanism as described in paragraphs 349 and 350.

207. Removal and Replacement of Carriage-Return Operating Mechanism

(fig. 239)

a. Removal.

(1) Remove the platen from the page printer as described in paragraph 174*a*.

(2) Remove the manual unshift lever link as described in paragraph 202*a*(5).

(3) Remove the horizontal carriage return link as described in paragraph 201*a*(4).

(4) Remove the two machine screws (1) and lockwashers (2) that hold the clutch latch mounting plate (16) to the page printer frame; remove the assembled carriage-return operating mechanism.

b. Replacement.

(1) Position the assembled carriage-return operating mechanism on the page printer frame so that the carriage-return clutch lever (21) engages the annular groove in the carriage-return sliding clutch drum. Secure the carriage-return mechanism to the page printer with the two machine screws (1) and lockwashers (2).

(2) Install the horizontal carriage-return link as described in paragraph 201*b*(9).

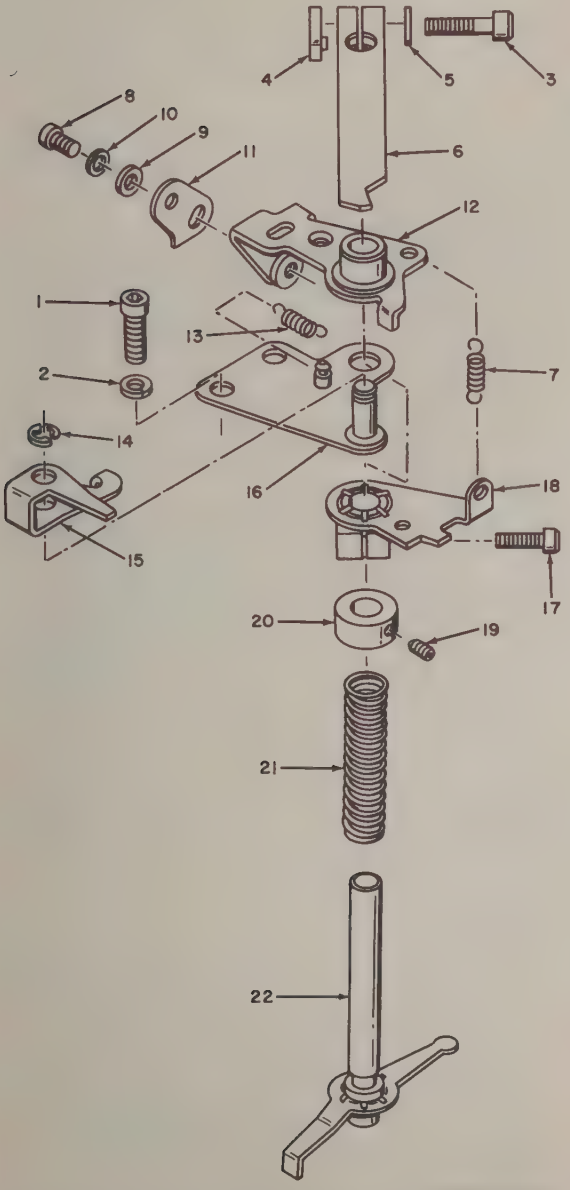


Figure 239. Carriage return operating mechanism, exploded view.

1	Machine screw, 10008
2	Lockwasher, 10430
3	Machine screw, 10006
4	Clamp nut, 50174
5	Flat washer, 10459
6	Throwout lever, 56283
7	Carriage-return clutch actuating lever spring, 56258
8	Machine screw, 10003
9	Flat washer, 10458
10	Lockwasher, 10429
11	Adjusting plate, 56237
12	Double blocking lever, 56265A
13	Double blocking lever spring, 50946
14	Retainer ring, 10949
15	Carriage-return clutch latch lever, 50011
16	Clutch latch mounting plate, 53163A
17	Machine screw, 10009
18	Carriage-return clutch actuating lever, 56241A
19	Setscrew, 10209
20	Shaft collar, 50209
21	Spring, 52259
22	Carriage-return clutch lever, 56243A

Figure 239—Continued.

(3) Install the manual unshift lever link as described in paragraph 202*b*(3).

(4) Install the platen on the page printer as described in paragraph 174*b*.

(5) Adjust the carriage-return operating mechanism as described in paragraphs 336, 338, 344, 345, 346, and 385.

208. Disassembly and Reassembly of Carriage-Return Operating Mechanism

(fig. 239)

a. Disassembly.

(1) Remove the carriage-return mechanism from the page printer as described in paragraph 207*a*.

(2) Remove the machine screw (3), flat washer (5), and clamp nut (4) that hold the throwout lever (6) to the shaft of the carriage-return clutch lever (22); remove the throwout lever.

(3) Remove the carriage-return clutch actuating lever spring (7) that connects the double blocking lever (12) and the carriage-return clutch actuating lever (18).

(4) Remove the assembled double blocking lever and adjusting plate (11) from the shaft of the carriage-return clutch lever (22).

(5) Remove the machine screw (8), plain washer (9), and lockwasher (10) that hold the adjusting plate (11) to the double blocking lever (12); remove the adjusting plate.

(6) Remove the double blocking lever spring (13) that connects the carriage-return clutch latch lever (15) and the clutch latch mounting plate (16).

(7) Remove the retainer ring (14) that holds the carriage-return clutch latch lever (15) to the stud on the clutch latch mounting plate (16); remove the carriage-return clutch latch lever.

(8) Remove the clutch latch mounting plate (16) from the shaft of the carriage-return clutch lever.

(9) Remove the machine screw (17) that holds the carriage-return clutch actuating lever (18) to the shaft of the carriage-return clutch lever (22); remove the clutch actuating lever.

(10) Remove the two setscrews (19) that hold the shaft collar (20) to the shaft of the carriage-return clutch lever; remove the shaft collar.

b. Reassembly.

(1) Place spring (21) on the carriage-return clutch lever and position the shaft collar (20) on the shaft of the carriage-return clutch lever (22); secure with the two setscrews (19).

(2) Position the clutch actuating lever (18) on the shaft of the carriage-return clutch lever; secure with a machine screw (17).

(3) Install the clutch latch mounting plate (16) on the shaft of the carriage-return clutch lever (22).

(4) Position the carriage-return clutch latch lever (15) on the stud on the clutch latch mounting plate (16); secure with a retainer ring (14).

(5) Install the double blocking lever spring (13) that connects the carriage-return clutch latch lever (15) and the spring post on the clutch latch mounting plate (16).

(6) Position the adjusting plate (11) on the double blocking lever (12); secure with a machine screw (8), lockwasher (10), and flat washer (9).

(7) Install the carriage-return clutch actuating lever spring (7) that connects the double blocking lever (12), and the carriage-return clutch actuating lever.

(8) Position the throwout lever (6) on the shaft of the carriage-return clutch lever; secure with a clamp nut (4), flat washer (5), and machine screw (3).

(9) Replace the carriage-return mechanism as described in paragraph 207*b*.

209. Disassembly and Reassembly of Carriage Rack Drive Shaft

(fig. 240)

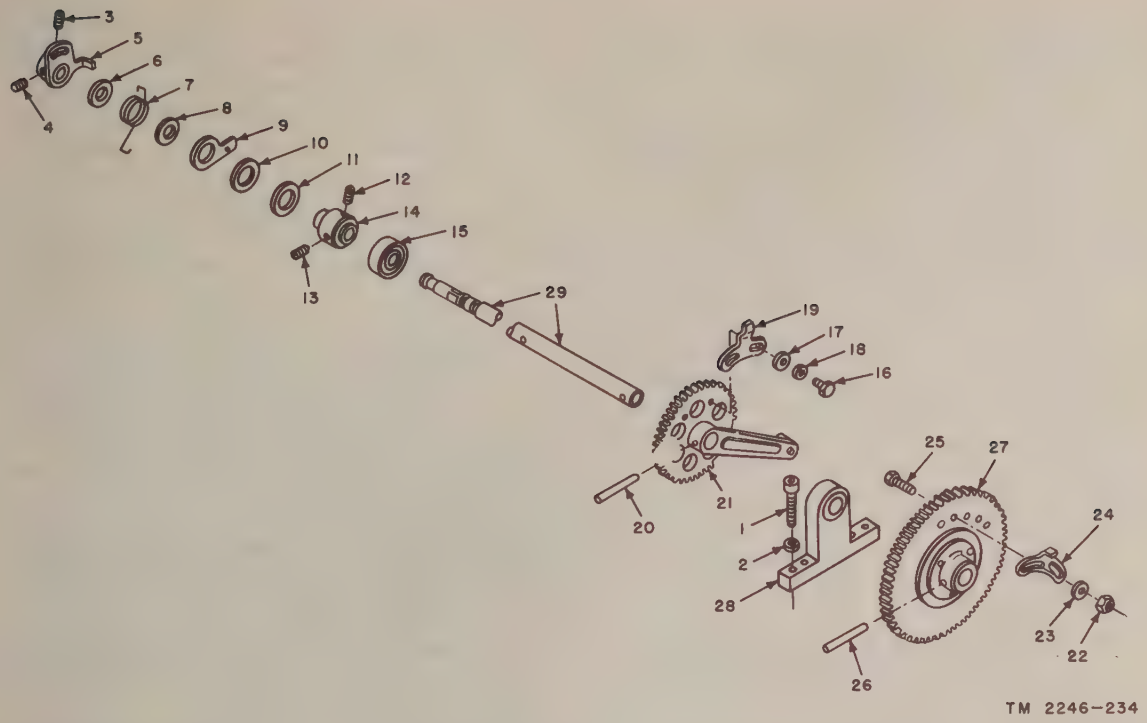
a. Disassembly.

(1) Remove the keyboard transmitter from the page printing mechanism as described in paragraph 153*a*.

(2) Remove the platen from the page printer as described in paragraph 174*a*.

(3) Remove the carriage from the page printer as described in paragraph 179*a*.

(4) Remove the two machine screws (1) and lockwashers (2) that hold bearing cap (28) to the front of the page printer frame.



1 Machine screw, 10011
2 Lockwasher, 10430
3 Setscrew, 10209
4 Setscrew, 10223
5 Carriage-return blocking lever adjusting collar, 55090A
6 Flat washer, 56254
7 Carriage-return blocking lever spring, 56269
8 Flat washer, 53783
9 Space pawl blocking lever, 56238
10 Flat washer, 51681
11 Flat washer, 10468
12 Setscrew, 10209
13 Setscrew, 10223
14 Collar, 51668
15 Ball bearing, 10759
16 Machine screw, 10303
17 Flatwasher, 10458
18 Lockwasher, 10429
19 Carriage-return latch-tripping arm, 55424
20 Taper pin, 10851
21 Carriage-return driven gear, 51747A
22 Self-locking hexagonal nut, 10500
23 Flat washer, 10450
24 Margin bell pawl trip arm, 50124
25 Machine screw, 10080
26 Taper pin
27 Carriage rack driving gear
28 Bearing cap, 55773
29 Carriage rack drive shaft, 55520A (includes items 26 and 27)

Figure 240. Carriage rack drive shaft, exploded view.

(5) Remove the two setscrews (3 and 4) that hold the carriage-return blocking lever adjusting collar (5) to the carriage rack drive shaft (29); remove the carriage-return blocking lever adjusting collar, flat washer (6), carriage-return blocking lever spring (7), flat washer (8), carriage-return blocking lever (9), and the two flat washers (10 and 11).

(6) Remove the two setscrews (12 and 13) that hold the collar (14) to the carriage rack drive shaft (29); remove the collar.

(7) Pull the assembled carriage rack drive shaft forward until it clears the ball bearing (15) in the page printer frame; remove the ball bearing from the frame.

(8) Remove the two machine screws (16), flat washers (17), and lockwashers (18), that hold the carriage-return latch tripping arm (19) to the carriage-return driven gear (21); remove the carriage-return latch-tripping arm.

(9) Remove the taper pin (20) that holds the carriage-return driven gear (21) to the carriage rack drive shaft (29); remove the carriage-return driven gear.

(10) Remove the two self-locking hexagonal nuts (22), flat washers (23), and machine screws (25), that hold the margin bell pawl trip arm (24) to the carriage rack driving gear; remove the margin bell pawl trip arm.

Note. Items 26, 27, and 29 comprise one part and ordinarily should not be disassembled.

b. Reassembly.

(1) Install the bearing cap (28) on carriage rack drive shaft (29).

(2) Position the margin bell pawl trip arm (24) on carriage rack driving gear; secure with the two machine screws (25), flat washers (23), and self-locking hexagonal nuts (22).

(3) Position the carriage-return driven gear (21) on carriage rack drive shaft (29); secure with a taper pin (20).

(4) Position the carriage-return latch tripping arm (19) on the carriage-return driven gear; secure with the two machine screws (16), lockwashers (18), and flat washers (17).

(5) Position the carriage rack drive shaft (29) through the bearing seat in the page printer frame; install ball bearing (15) on the shaft. Press the ball bearing into the bearing seat.

(6) Position the collar (14) on the carriage rack drive shaft; secure with two setscrews (12 and 13).

(7) Install two flat washers (11 and 10), the carriage-return blocking lever (9), a flat washer (8), carriage-return blocking lever spring (7), and flat washer (6), on the carriage rack drive shaft (29). Position the carriage-return blocking lever adjusting collar (5) on the shaft; secure with two setscrews (3 and 4).

(8) Position bearing cap (28) on the page printer frame; secure with the two machine screws (1) and lockwashers (2).

(9) Install the carriage on the page printer as described in paragraph 179*b*.

(10) Install the platen on the page printer as described in paragraph 174*b*.

(11) Install the keyboard transmitter on the page printing mechanism as described in paragraph 153*b*.

(12) Adjust the carriage rack drive shaft as described in paragraphs 336, 338, 344,345, 346, and 385.

210. Disassembly and Reassembly of Margin Signal Bell

(fig. 241)

a. Disassembly.

(1) Remove the keyboard transmitter from the page printing mechanism as described in paragraph 153*a*.

(2) Remove screws 10008 and lockwashers 10430 that hold margin bell bracket 53164A to the page printer frame; remove the margin signal bell assembly.

(3) Remove spring 50231 from margin bell clapper 50244A and from spring post on margin bell bracket 53164A.

(4) Remove E-ring 10960 that holds margin bell clapper 50244 to margin bell bracket 53164A; remove margin bell clapper 50244A.

(5) Remove locknut 10500, screw 10003, and lockwasher 10429 that hold margin signal bell 51403 to margin bell bracket 53164A: remove margin signal bell 51403.

(6) Remove spring 50232 from margin bell clapper 50244A.

b. Reassembly.

(1) Install spring 50232 on margin bell clapper 50244A.

(2) Position margin signal bell 51403 on margin bell bracket 53164A; secure with screw 10003, lockwasher 14029, and locknut 10500.

(3) Position margin bell clapper 50244A on margin bell bracket 53164A; secure with E-ring 10960.

(4) Install spring 50231 on margin bell clapper 50244A and on margin bell bracket 53164A.

(5) Position the margin bell bracket assembly on the page printer frame; secure with the two screws 10008 and lockwashers 10430.

(6) Replace the keyboard transmitter on the page printing mechanism as described in paragraph 153*b*.

(7) Adjust the margin signal bell as instructed in paragraph 385.

211. Removal and Replacement of Carriage Feed Shaft

(fig. 242)

a. Removal.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the keyboard transmitter from the page printing mechanism as described in paragraph 153*a*.

(3) Remove the platen from the page printer as described in paragraph 174*a*.

(4) Remove the carriage feed mechanism

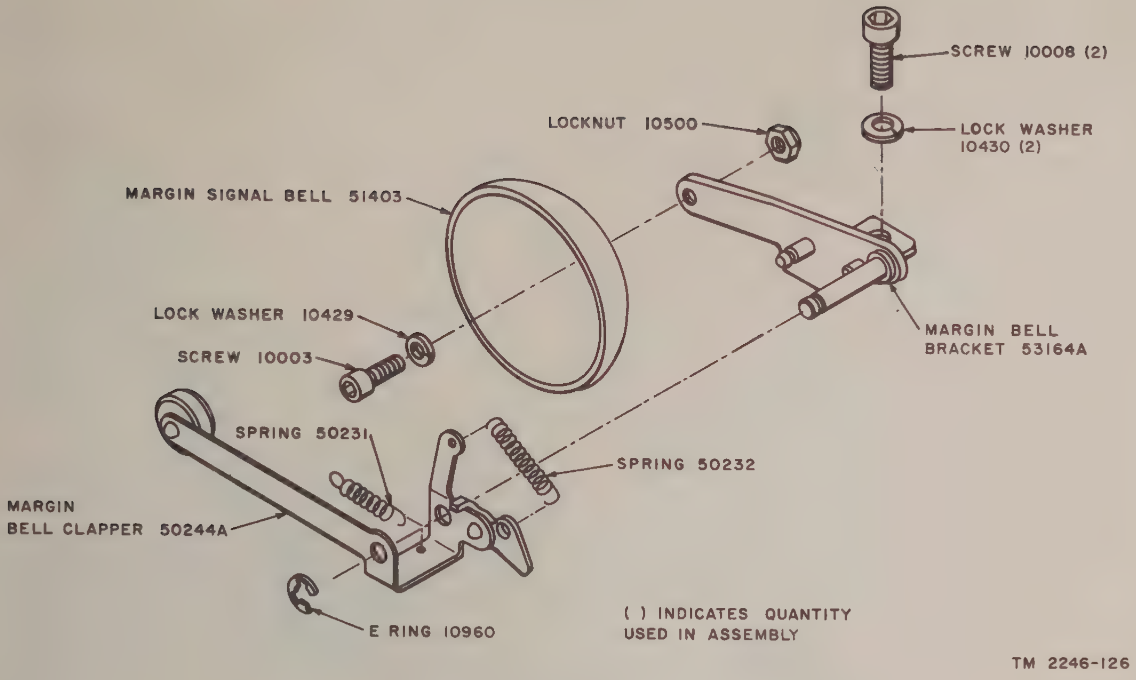


Figure 241. Margin signal bell, exploded view.

from the page printer as described in paragraph 206*a*.

(5) Remove the machine screw (1) and lockwasher (2) that hold the bearing block to the page printer frame; remove the assembled bearing block and ball bearing (6).

(6) Remove the two machine screws (3), flat washers (4), and lockwashers (5), that hold the ball bearing (6) to the bearing block; remove the ball bearing.

(7) Remove the two machine screws (7), flat washers (8), and lockwashers (9) that hold the bearing retainer (10), to the printer frame; remove the bearing retainer.

(8) Remove the self-locking hexagonal nut (11) that holds ball bearing (12) to the carriage feed shaft (34); pull the shaft forward far enough to clear the ball bearing. Remove the carriage feed shaft from the page printer.

(9) Remove the ball bearing from the bearing seat in the page printer frame.

b. Replacement.

(1) Position the ball bearing (12) in the bearing seat in the page printer frame.

(2) Position the assembled carriage feed shaft in the ball bearing in the bearing seat on the page printer frame; secure with the self-locking hexagonal nut (11).

(3) Position the bearing retainer (10) on the printer frame; secure with the two machine screws (7), lockwashers (9), and flat washers (8).

(4) Position the ball bearing (6) in the bearing block; secure the two machine screws (3), lockwashers (5), and flat washers (4).

(5) Position the assembled ball bearing and bearing block on the carriage feed shaft (34), positioning the bearing block so that the drilled hole in the bearing block is alined with the tapped hole in the page printer frame; secure with a machine screw (1) and lockwasher (2).

(6) Install the carriage feed mechanism on the page printer as described in paragraph 206*b*.

(7) Install the platen on the page printer as described in paragraph 174*b*.

(8) Install the keyboard transmitter on the page printing mechanism as described in paragraph 153*b*.

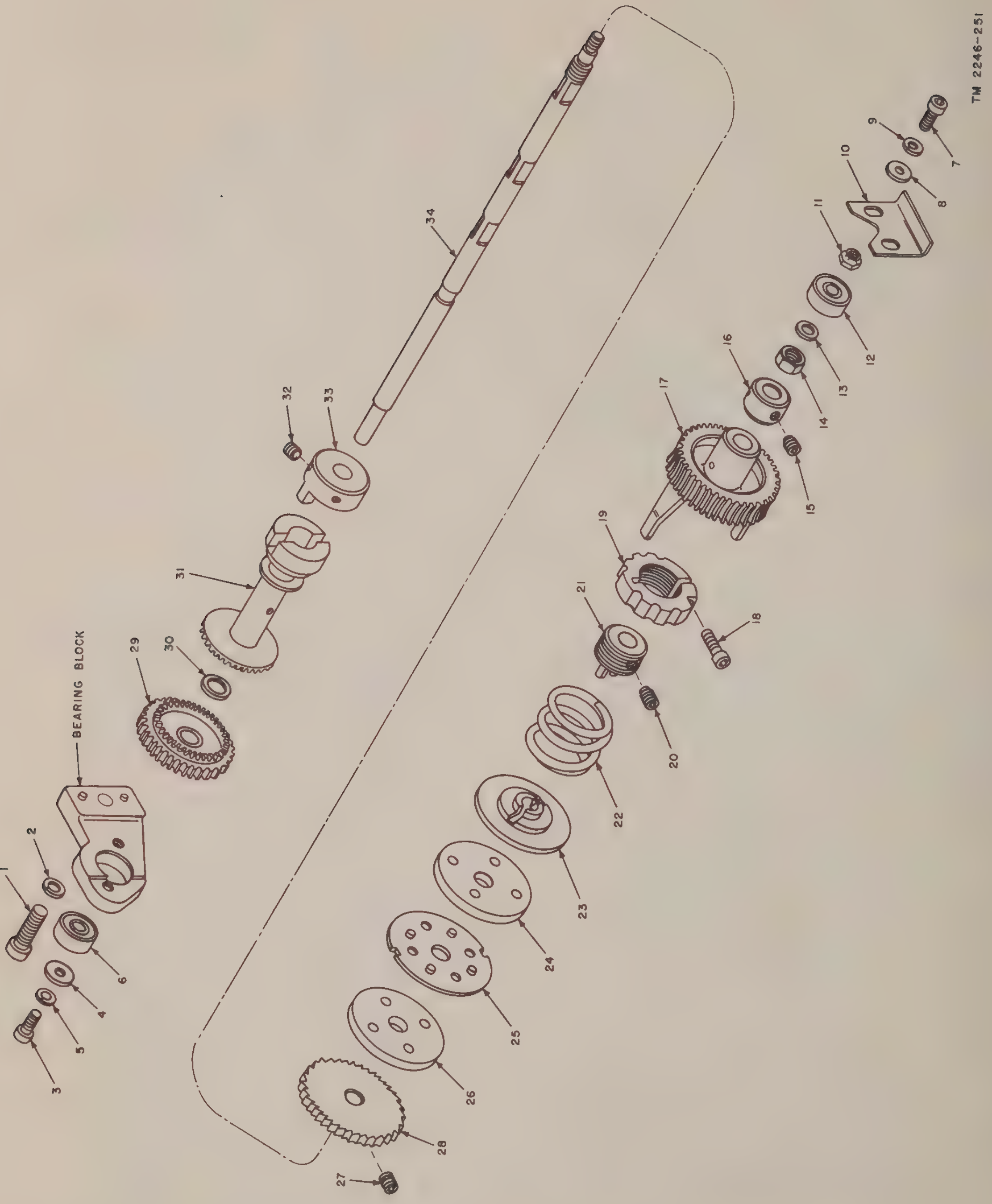


Figure 242. Carriage feed shaft, exploded view.

1 Machine screw, 10017
2 Lockwasher, 10405
3 Machine screw, 10003
4 Flat washer, 10450
5 Lockwasher, 10429
6 Ball bearing, 10755
7 Machine screw, 10003
8 Flat washer, 10459
9 Lockwasher, 10429
10 Bearing retainer, 55020
11 Self-locking hexagonal nut, 10500
12 Ball bearing, 10755
13 Flat washer, 51408
14 Adjusting nut, 51079
15 Setscrew, 10209
16 Shaft collar, 50209
17 Carriage feed driven gear, 54930A
18 Clamping screw, 10052
19 Adjusting collar, 54926
20 Setscrew, 10208
21 Drive shaft collar, 54928
22 Friction clutch spring, 54934
23 Friction clutch plate, 54931
24 Friction plate, 50013
25 Clutch driving disk, 51117
26 Friction plate, 50013
27 Setscrew, 10209
28 Ratchet wheel, 50201
29 Carriage feed driving gear, 50884A
30 Flat washer, 50887
31 Carriage feed sliding clutch drum, 50331
32 Setscrew, 10209
33 Shaft collar, 50336
34 Carriage feed shaft, 50525

Figure 242—Continued.

(9) Install the page printer on the printer base as described in paragraph 152*b*.

(10) Adjust the carriage feed shaft as described in paragraphs 337, 369, 370, 371, and 372.

212. Disassembly and Reassembly of Carriage-Feed Shaft

(fig. 242)

a. Disassembly.

(1) Remove the carriage-feed shaft as described in paragraph 211*a*.

(2) Remove adjusting nut (14) from the carriage-feed shaft (34); loosen the two setscrews (15) and remove the shaft collar (16) from the carriage-feed shaft (34).

(3) Slide the carriage-feed driven gear (17) from the clutch driving disk (25) and from the carriage-feed shaft (34).

(4) Loosen clamping screw (18); back off and remove the adjusting collar (19).

(5) Remove the two setscrews (20) holding drive shaft collar (21) on the carriage-feed shaft (34); remove the drive shaft collar.

(6) Remove friction clutch spring (22), friction clutch plate (23), friction plate (24), clutch driving disk (25), and friction plate (26) from the carriage-feed shaft (34).

(7) Remove the two setscrews (27) holding ratchet wheel (28) on the carriage-feed shaft (34); remove the ratchet wheel.

(8) Remove carriage-feed driving gear (29), the flat washer (30), and the carriage-feed sliding clutch drum (31), from the carriage-feed shaft (34).

(9) Remove the two setscrews (32) holding shaft collar (33) on the carriage-feed shaft (34); remove the shaft collar.

b. Reassembly.

(1) Position shaft collar (33) on the carriage-feed shaft (34); hold with two setscrews (32), seating the setscrews in the groove of the carriage-feed shaft.

(2) Slide the carriage-feed sliding clutch drum (31), a flat washer (30), and the carriage-feed driving gear (29) on the carriage-feed shaft (34).

(3) Position ratchet wheel (28) on the carriage-feed shaft (34); attach with two setscrews (27).

(4) Install friction plate (26), clutch driving disk (25), friction plate (24), friction clutch plate (23), and the friction clutch spring (22), on the carriage-feed shaft (34); position the holes in the friction plates on the pins on the clutch driving disk.

(5) Position drive shaft collar (21) on the carriage-feed shaft (34); attach with two setscrews (20).

(6) Screw adjusting collar (19) on the drive shaft collar (21); tighten friction clutch spring (22) to approximately correct tension and install the clamping screw (18) to prevent the adjusting collar from turning.

(7) Slide carriage-feed driven gear (17) on the carriage-feed shaft (34); position the two arms of the gear in the slots in the circumference of the clutch driving disk (25).

(8) Position shaft collar (16) on the carriage-feed shaft (34); secure with two setscrews (15). Install the adjusting nut (14) on the carriage-feed shaft (34).

(9) Install and adjust the carriage-feed shaft as described in paragraph 211*b*.

213. Disassembly and Reassembly of Carriage-Return Shaft

(fig. 243)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the keyboard transmitter from the page printing mechanism as described in paragraph 153*a*.

(3) Remove the platen from the page printer as described in paragraph 174*a*.

(4) Remove the carriage feed clutch lever as described in paragraph 206*a*(7).

(5) Mark the two teeth on the carriage-return driving gear of the carriage-return safety clutch (16) that engage the last tooth on the carriage return driven gear.

(6) Remove the two machine screws (1), flat washers (2), and lockwashers (3), that hold the bearing retainer (4) to the page printer frame; remove the bearing retainer.

(7) Remove the two machine screws (5) and lockwashers (6) that hold the bearing cap to the page printer frame; remove the bearing cap.

(8) Remove the two machine screws (7) and lockwashers (8) that hold the bearing cap to the page printer frame; remove the bearing cap.

(9) Remove the self-locking hexagonal nut (9) and flat washer (10) that hold ball bearing (11) to the carriage-return shaft (24); remove the ball bearing.

(10) Lift the front of the carriage-return shaft (24) slightly and slide the oilite bearing (21) toward the rear of the shaft, far enough to clear the bearing seat in the page printer frame.

(11) Loosen the machine screw that holds carriage-return clutch actuating lever to the carriage-return clutch lever. Tilt the carriage-return shaft (24) forward, far enough to clear the carriage-return clutch lever and pivot the lever so that it is parallel with the carriage-return shaft. Pull the carriage-return shaft upward and forward to remove it from the page printer.

(12) Remove retainer ring (12) that holds the carriage-return safety clutch (16); remove the assembled carriage-return safety clutch and decelerating cam (14).

(13) Remove the two machine screws (13) that hold decelerating cam (14) to the carriage-return safety clutch (16); remove the decelerating cam.

(14) Remove the two dowel pins (15) from the carriage-return safety clutch (16).

(15) Remove the two spacers (17 and 18) from the carriage-return shaft (24).

(16) Tap out taper pin (19) that holds the carriage-return sliding clutch disk (20) to the carriage-return shaft (24); remove the carriage-return sliding clutch disk and the oilite bearing (21).

(17) Tap out taper pin (22) that holds the carriage-return shaft driven gear (23) to the carriage-return shaft (24); remove the carriage-return shaft driven gear.

b. Reassembly.

(1) Position the carriage-return shaft driven gear (23) on the carriage-return shaft (24); secure with a taper pin (22).

(2) Position oilite bearing (21) and carriage-return sliding clutch disk (20) on the carriage-return shaft (24); secure the carriage-return clutch disk to the shaft with a taper pin (19).

(3) Position the two spacers (18 and 17) on the carriage-return shaft (24).

(4) Install the two dowel pins (15) in the carriage-return safety clutch (16).

(5) Position decelerating cam (14) on the carriage-return safety clutch (16); secure with the two machine screws (13).

(6) Position the assembled carriage-return safety clutch (16) and decelerating cam (14) on the carriage-return shaft (24); secure with a retainer ring (12).

(7) Slide the oilite bearing (21) toward the rear of the carriage-return shaft (24) so that it clears the bearing seat in the page printer casting. Position the assembled carriage-return shaft on the page printer so that the two marked teeth on the carriage-return driving gear of the carriage-return safety clutch (16) engage the last tooth on the carriage return driven gear. Tighten the machine screw that holds the carriage-return clutch actuating lever to the carriage-return clutch lever.

(8) Lift the front of the carriage-return shaft (24) far enough to slide the oilite bearing (21) into position on the shaft.

(9) Position ball bearing (11) on the carriage-return shaft (24); secure with a flat washer (10) and self-locking hexagonal nut (9).

(10) Position the front bearing cap on the page printer frame; secure with two machine screws (7) and lockwashers (8).

(11) Position the rear bearing cap on the page printer frame; secure with two machine screws (5) and lockwasher (6).

(12) Position bearing retainer (4) on the page printer frame; secure with two machine screws (1), lockwashers (3), and flat washers (2).

(13) Install the carriage feed clutch lever as described in paragraph 206*b*(2).

(14) Install the platen on the page printer as described in paragraph 174*b*.

(15) Install the keyboard transmitter on the page printing mechanism as described in paragraph 153*b*.

(16) Install the page printer on the printer base as described in paragraph 152*b*.

(17) Adjust the carriage-return shaft as described in paragraphs 340 and 373.

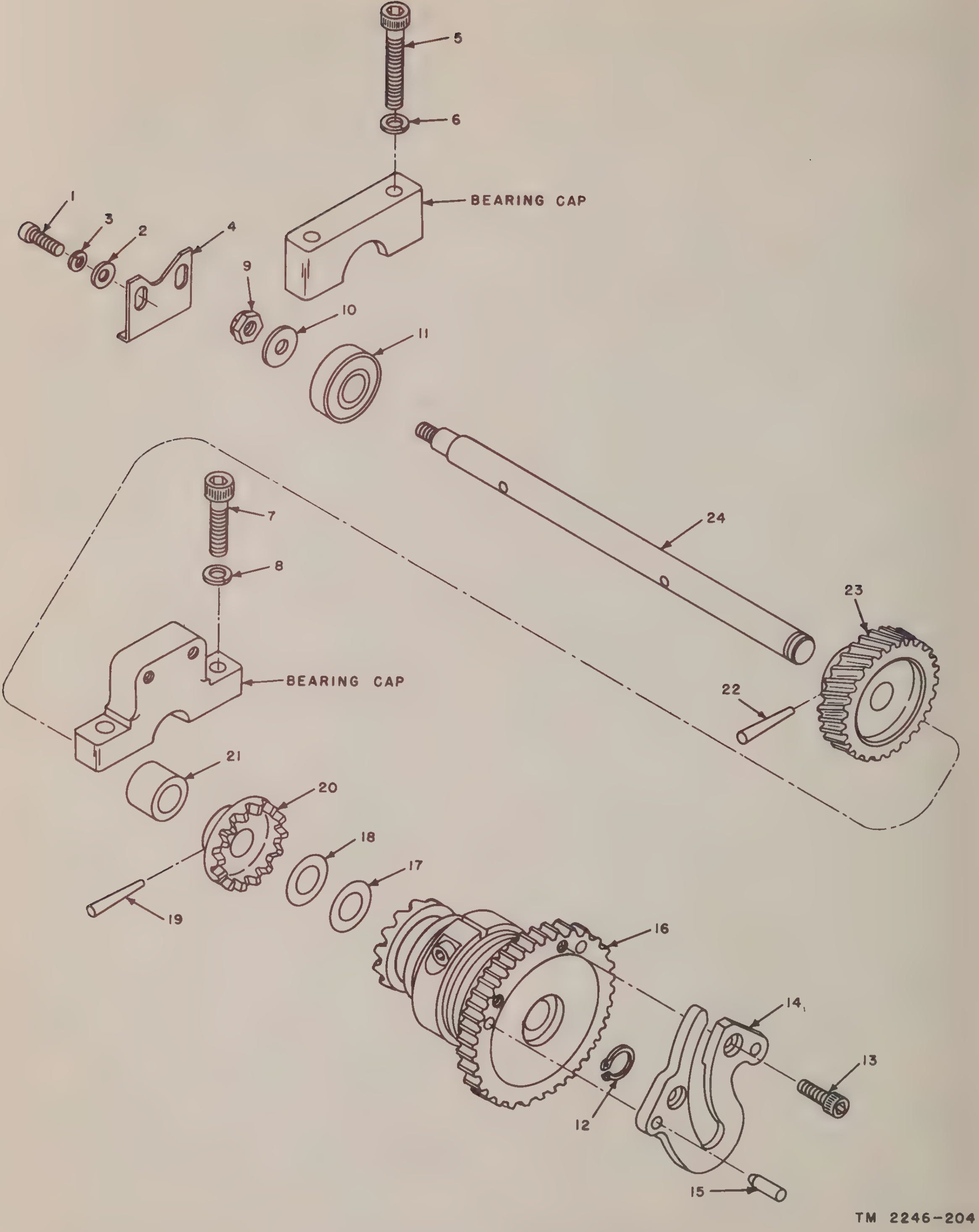


Figure 243. Carriage-return shaft, exploded view.

1	Machine screw, 10003
2	Flat washer, 10459
3	Lockwasher, 10429
4	Bearing retainer, 55020
5	Machine screw, 10012
6	Lockwasher, 10430
7	Machine screw, 10011
8	Lockwasher, 10430
9	Self-locking hexagonal nut, 10500
10	Flat washer, 10458
11	Ball bearing, 10759
12	Retainer ring, 10451
13	Machine screw, 10001
14	Decelerating cam, 50364
15	Dowel pin, 10917
16	Carriage-return safety clutch, 51642A
17	Spacer, 52117
18	Spacer, 52118
19	Taper pin, 10852
20	Carriage-return sliding clutch disk, 50211
21	Oilite bearing, 10711
22	Taper pin, 10852
23	Carriage-return shaft driven gear, 55164
24	Carriage-return shaft, 55171

Figure 243—Continued.

214. Disassembly and Reassembly of Carriage-Return Safety Clutch

(fig. 244)

a. Disassembly.

(1) Remove the carriage-return shaft as described in paragraphs 213*a*(1) through (11).

(2) Remove the carriage-return safety clutch from the carriage-return shaft as described in paragraph 213*a*(13).

(3) Remove retainer ring (1) and the flat washer (2) from the end of the sleeve (13).

(4) Remove carriage-return sliding clutch drum (3) from sleeve (13); catch the nine positioning balls (4) as they drop out of the carriage-return sliding clutch drum.

(5) Remove machine screw (5) from the adjusting collar (6); remove the adjusting collar from the threaded portion of the sleeve.

(6) Remove spring (7) and the ball retainer ring (8) from the sleeve.

(7) Remove clutch disk (9), friction plate (10), carriage-return driving gear (11), and friction plate (12) from the sleeve.

b. Reassembly.

(1) Assemble friction plate (12), carriage-return driving gear (11), friction plate (10), and clutch disk (9), on sleeve (13).

(2) Position ball retainer ring (8) and spring (7) on sleeve (13).

(3) Start adjusting collar (6) on the threaded portion of sleeve (13); turn it into spring (7) but do not draw it up tight.

(4) Start machine screw (5) in adjusting collar (6); do not draw it up tight.

(5) Position the carriage return sliding clutch drum (3) on the sleeve (13); drop the nine positioning balls (4) into the three grooves.

(6) Place flat washer (2) on the end of the sleeve (13); install the retainer ring (1).

(7) Adjust the carriage-return safety clutch as described in paragraphs 340 and 373.

(8) Install the carriage-return safety clutch in the carriage-return shaft as described in paragraph 213*b*(6).

(9) Install the carriage-return shaft as described in paragraph 213*b*(7) through (19).

215. Disassembly and Reassembly of Keyboard Transmitter Drive Shaft

(fig. 245)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the keyboard transmitter from the page printer as described in paragraph 153*a*.

(3) Remove the two machine screws (1) and lockwashers (2) that hold the bearing cap to the page printer frame; remove the bearing cap.

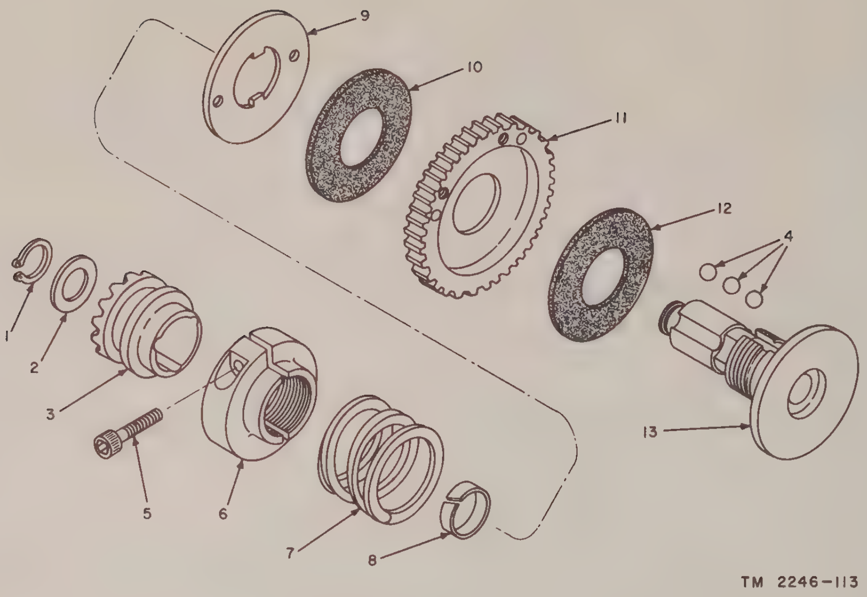
(4) Remove the two machine screws (3) and lockwashers (4) that hold the mounting bracket (26) to the page printer frame.

(5) Remove the two setscrews (5) that hold the friction clutch disk (6) to the transmitter drive shaft (25); remove the friction clutch disk, friction plate (7), clutch driver plate (8), friction plate (9), friction clutch plate (10), and friction clutch spring (11).

(6) Remove the clamping screw (12) that holds the friction adjusting collar (13) to the drive shaft collar (15); turn off the friction adjusting collar.

(7) Remove the two setscrews (14) that hold the drive shaft collar (15) to the transmitter drive shaft (25); remove the drive shaft collar.

(8) Remove the two machine screws (16), flat washers (17), and lockwashers (18), that hold the bearing retainer (19) to the



1 Retainer ring, 10453
2 Flat washer, 50306
3 Carriage return sliding clutch drum, 51406A (includes item 13)
4 Positioning ball, 10908
5 Machine screw, 10010
6 Adjusting collar, 51697
7 Spring, 55042
8 Ball retainer ring, 51651
9 Clutch disk, 51678
10 Friction plate, 50260
11 Carriage-return driving gear, 50257
12 Friction plate, 50260
13 Sleeve

Figure 244. Carriage-return safety clutch, exploded view.

page printer frame; remove the bearing retainer.

(9) Remove the self-locking hexagonal nut (20) that holds the ball bearing (22) to the transmitter drive shaft (25); remove the ball bearing and spacer (21).

(10) Tilt the transmitter shaft forward enough to clear the gear on the main shaft and remove the assembled transmitter drive shaft and transmitter shaft driven gear (24).

(11) Remove taper pin (23) that holds the transmitter shaft driven gear (24) to the transmitter drive shaft (25); remove the transmitter shaft driven gear and the mounting bracket (26).

b. Reassembly.

(1) Position mounting bracket (26) and the transmitter shaft driven gear (24) on the transmitter drive shaft (25); secure the transmitter shaft driven gear with taper pin (23).

(2) Position the assembled transmitter shaft driven gear and transmitter drive shaft on the page printer.

(3) Position ball bearing (22) on the transmitter drive shaft (23); place washer (21) in position and secure with a self-locking hexagonal nut (20).

(4) Position bearing retainer (19) on the page printer frame; secure with the two machine screws (16), lockwashers (18), and flat washers (17).

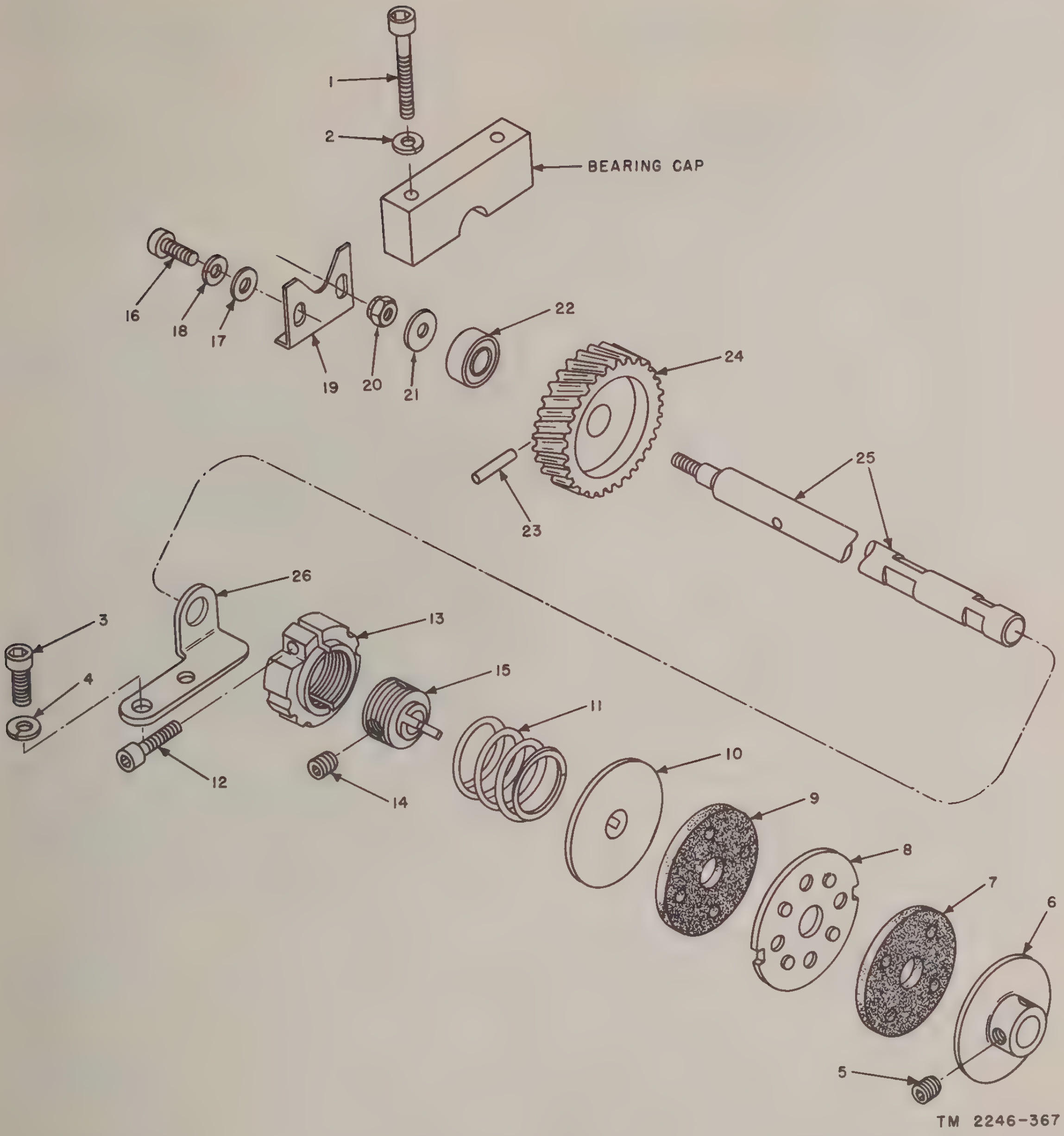
(5) Position drive shaft collar (15) on the transmitter drive shaft (25); secure with the two setscrews (14).

(6) Turn friction adjusting collar (13) on the drive shaft collar (15); secure with clamping screw (12).

(7) Position the friction clutch spring (11), friction clutch plate (10), friction plate (9), clutch driver plate (8), friction plate (7), and friction clutch disk (6), on the transmitter drive shaft (25); secure the friction clutch disk to the transmitter drive shaft with the two setscrews (5).

(8) Position mounting bracket (26) on the page printer frame; secure with the two machine screws (3) and lockwashers (4).

(9) Position the bearing cap on the page printer frame; secure with the two machine screws (1) and lockwashers (2).



1 Machine screw, 10012
2 Lockwasher, 10430
3 Machine screw, 10025
4 Lockwasher, 10430
5 Setscrew, 10209
6 Friction clutch disk, 50200
7 Friction plate, 50913
8 Clutch driver plate, 51117
9 Friction plate, 50013
10 Friction clutch plate, 54931
11 Friction clutch spring, 54932
12 Clamping screw, 10052
13 Friction adjusting collar, 54926
14 Setscrew, 10208
15 Drive shaft collar, 54928
16 Machine screw, 10003
17 Flat washer, 10459
18 Lockwasher, 10429
19 Bearing retainer, 55020
20 Self-locking hexagonal nut, 10500
21 Washer, 50414
22 Ball bearing, 10755
23 Taper pin, 10854
24 Transmitter shaft driven gear, 55163
25 Transmitter drive shaft, 55172
26 Mounting bracket, 55787

Figure 245. Keyboard transmitter drive shaft, exploded view.

(10) Install the keyboard transmitter on the page printing mechanism as described in paragraph 153*b*.

(11) Adjust the keyboard transmitter drive shaft as directed in paragraph 414.

(12) Install the page printer on the printer base as described in paragraph 152*b*.

216. Disassembly and Reassembly of Gear Cover Group

(fig. 208)

a. Disassembly.

(1) Remove gear cover (6) and worm gear bracket (9) as directed in paragraph 168*a* (2).

(2) Remove cotter pin (4) that holds main shaft driven gear (5) to the stud on the gear cover; remove the driven gear.

(3) Remove cotter pin (7) that holds worm gear (8) to the worm gear bracket (9); remove the worm gear.

b. Reassembly.

(1) Position worm gear (8) on the worm gear bracket (9); secure with cotter pin (7).

(2) Position main shaft driven gear (5) on the stud on gear cover (6); secure with cotter pin (4).

Note. Make sure the gears installed are correct for the operating speed desired and that the gear speeds match (par. 29).

(3) Install gear cover and worm gear bracket on the page printer as instructed in paragraph 168*b*(3).

217. Disassembly and Reassembly of Selector-Magnet Bracket

(fig. 208)

a. Disassembly.

(1) Remove the two machine screws (10) and lockwashers (11) that hold the bracket (16) to the page printer frame; remove the assembled bracket and adjustment screws (15).

(2) Remove the two machine screws (12) and lockwashers (13) that hold the anchor plates (14) to the bracket (16); remove the two anchor plates.

(3) Remove the two adjustment screws (15) from bracket (16).

b. Reassembly.

(1) Install adjustment screws (15) in bracket (16).

(2) Position anchor plates (14) on bracket (16); secure with the two machine screws (12) and lockwashers (13).

(3) Position the assembled bracket (16) and the adjustment screws (15) on the page printer frame; secure with the two machine screws (10) and lockwashers (11).

218. Disassembly and Reassembly of Platen Bracket

(fig. 208)

a. Disassembly.

(1) Remove the two machine screws (17) and lockwashers (18) that hold the platen bracket (22) to the page printer frame; remove the platen bracket.

(2) Remove bumper (19) from the platen bracket (22).

(3) Remove the machine screw (20) and plain hexagonal nut (21) from the platen bracket (22).

b. Reassembly.

(1) Install the plain hexagonal nut (21) on the machine screw (20). Install the assembled plain hexagonal nut and machine screw on platen bracket (22).

(2) Install bumper (19) in the platen bracket (22).

(3) Position platen bracket (22) on the page printer frame; secure with the two machine screws (17) and lockwashers (18).

219. Disassembly and Reassembly of Platen Lock Mechanism

(fig. 208)

a. Disassembly.

(1) Remove the assembled setscrew (23), plain wingnut (27), and platen lock (25) from the page printer frame.

(2) Remove the plain hexagonal nut (24), platen lock (25), and lockwasher (26) from setscrew (23).

(3) Remove the plain wingnut (27) from setscrew (23).

b. Reassembly.

(1) Position the plain wingnut (27) on setscrew (23).

(2) Position lockwasher (26) and platen lock (25) on setscrew (23); secure with a plain hexagonal nut (24).

(3) Install the assembled setscrew (23), platen lock (25), and plain wing nut (27), on the page printer frame.

220. Disassembly and Reassembly of Motor-Stop Switch Assembly

(fig. 208)

a. Disassembly.

(1) Remove the motor-stop switch plug from the socket in the printer base.

(2) Remove machine screw (30), flat washer (31), and lockwasher (32) that hold the right side of the switch bracket to the page printer frame. Remove machine screw (28) and lockwasher (29) that hold the ground lead and the left side of the switch bracket to the page printer frame; remove the ground lead and the motor-stop switch assembly (35).

(3) Remove machine screw (33) that holds the contact shield (34) to the motor-stop switch assembly (35); remove the contact shield.

b. Reassembly.

(1) Position contact shield (34) on the motor-stop switch assembly (35), secure with machine screw (33).

(2) Position the bracket of the motor-stop switch assembly (35) on the page printer frame; position lockwasher (29) and the ground lead on machine screw (28); install the screw to hold the left side of the motor-stop switch bracket to the page printer frame. Secure the right side of the bracket to the page printer frame with machine screw (30), lockwasher (32), and flat washer (31).

(3) Install the motor-stop switch plug in the socket in the page printer base.

(4) Adjust the motor-stop switch assembly as instructed in paragraph 386.

221. Removal and Replacement of Miscellaneous Printer Frame Connecting Hardware

(fig. 208)

a. Printer Frame Mounting Hardware. Four machine screws (39), eight lockwashers (40), and four electrical leads (41) are used to secure the page printer frame to the vibration mounts on the printer base.

b. Printer Frame Connecting Hardware. Eight machine screws (43, 47, and 49) and lockwashers (44, 48, and 50) hold the sides of the printer frame to the bottom frame; dowels are inserted between the components of the frame to keep the frame in alinement. Remove and replace frame hardware only if it is broken or damaged.

Note. The page printer frame is made up of three major units and a number of bearing caps, all of which are machined together to insure correct alinement of the components. For this reason, the page printer frame is sold only as a unit and must be replaced as such. Never disassemble the page printer frame unless it is to be replaced.

222. Disassembly and Reassembly of Paper Roller Stand, and Terminal Box

(fig. 246)

a. Disassembly.

(1) Pull paper roller latch (4) to the rear and remove the paper roller shaft (1).

(2) Remove paper roller latch spring (2) from paper roller latch (4) and from the spring post on the paper roller stand (18).

(3) Remove the retainer ring (3) that holds paper roller latch (4) to a stud on the paper roller stand (18); remove the paper roller latch.

(4) Remove machine screw (5), flat washer (7) and lockwasher (8) that hold the rear paper deflector (6) to the paper roller stand; remove the rear paper deflector (6).

(5) Remove the two self-locking hexagonal nuts (9), machine screws (10), and flat washers (11) that hold the paper stand cross brace (12) to the paper roller stand (18); remove the paper stand cross brace.

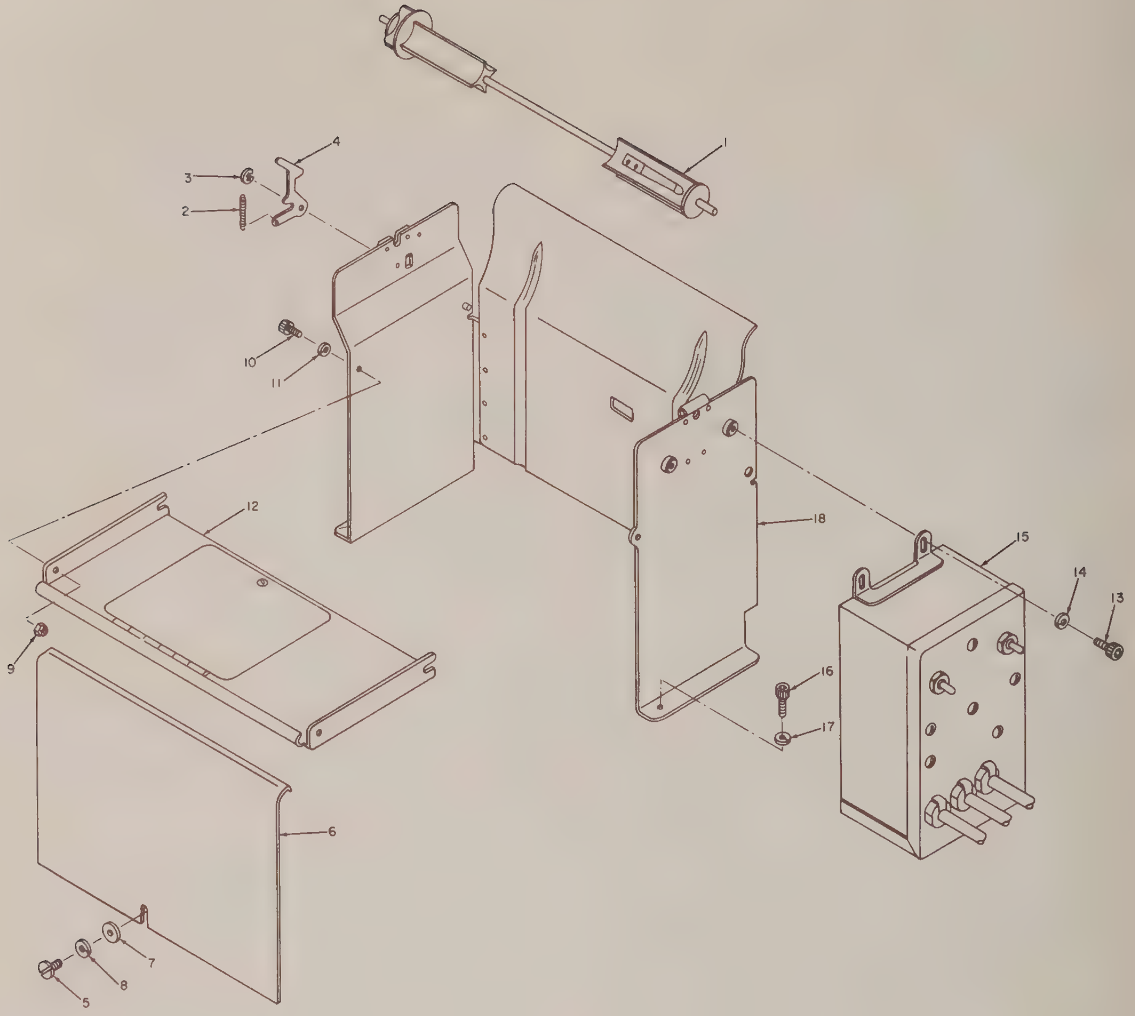
(6) Remove the two machine screws (13) and lockwashers (14) that hold terminal box (15) to the paper roller stand (18); lift the terminal box far enough to clear the multiple jack on the printer base under the terminal box. Remove the terminal box.

(7) Remove the four machine screws (16) and lockwashers (17) that hold the paper roller stand (18) to the printer base; remove the paper roller stand.

b. Reassembly.

(1) Position paper roller stand (18) on the printer base; secure with the four machine screws (16) and lockwashers (17).

(2) Position terminal box (15) on the paper roller stand so that the plug at the base of the terminal box is inserted in the multiple contact jack in the printer base. Secure the terminal box to the paper



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1 Paper roller shaft, 50605A
2 Paper roller latch spring, 50912
3 Retainer ring, 10949
4 Paper roller latch, 52938
5 Machine screw, 10111
6 Rear paper deflector, 55537
7 Flat washer, 10450
8 Lockwasher, 10429
9 Self-locking hexagonal nut, 10500
10 Machine screw, 10003
11 Flat washer, 10450
12 Paper stand cross brace, 53405A
13 Machine screw, 10008
14 Lockwasher, 10430
15 Terminal box, 53640A
16 Machine screw, 10008
17 Lockwasher, 10430
18 Paper roller stand, 53490A

Figure 246. Paper roller stand and terminal box, exploded view.

roller stand with the two machine screws (13) and lockwashers (14).

(3) Position paper stand cross brace (12) on the paper roller stand (18) so that the notches in the front of the brace engage the studs on the paper roller stand; secure with the two machine screws (10), flat washers (11), and self-locking hexagonal nuts (9).

(4) Position the rear paper deflector (6) on paper roller stand (18); secure with machine screw (5), lockwasher (8), and flat washer (7).

(5) Position paper roller latch (4) on the stud on the paper roller stand (18); secure with a retainer ring (3).

(6) Install the spring on paper roller latch (4) and on the spring stud on paper roller stand (18).

(7) Insert paper roller shaft (1) in the hole in paper roller stand (18); pull back the paper roller latch (4) and insert the other

end of the paper roller shaft (1) in the notch in the paper roller stand; release the paper roller latch.

223. Disassembly and Reassembly of Keyboard Guard

(fig. 247)

a. Disassembly.

(1) Remove the four machine screws (1) and lockwashers (2) that hold cover plates (3) to the keyboard guard (15); remove the two cover plates.

(2) Remove the two hexagonal nuts that hold the toggle switches to switch plate (6). Remove the four machine screws (4) and lockwashers (5) that hold the switch plate to the keyboard guard (15); remove the switch plate.

(3) Remove the two hexagonal nuts that hold the two toggle switches to switch plate (9). Remove the round nut and end of line jewel and the end of line lamp from the switch plate. Remove the four machine screws (7) and lockwashers (8) that hold switch plate (9) to the keyboard guard (15); remove the switch plate.

(4) Remove the two machine screws (10), lockwashers (11), two machine screws (12), and lockwashers (13) that hold the keyboard guard (15) to the printer base (74); remove the spacer plates (14) and the keyboard guard.

b. Reassembly.

(1) Position the spacer plates (14) and the keyboard guard (15) on the printer base (74); secure with the two machine screws (10), lockwashers (11), machine screws (12), and lockwashers (13).

(2) Position switch plate (9) on the keyboard guard (15); secure with the four machine screws (7) and lockwashers (8). Position the two toggle switches on the switch plate; secure with two hexagonal nuts. Position the end-of-line lamp on the switch plate; secure with the round nut and end of line jewel.

(3) Position the switch plate (6) on the keyboard guard (15); secure with four machine screws (4) and lockwashers (5). Position the two toggle switches on the switch plate; secure with the two hexagonal nuts.

(4) Position the two cover plates (3) on the keyboard guard (15); secure with the four machine screws (1) and lockwashers (2).

224. Disassembly and Reassembly of Vibration Mounts

(fig. 247)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the four machine screws (44) and lockwashers (45) that hold each of the four vibration mounts to the printer base (74); remove the four vibration mounts.

(3) Remove the plain hexagonal nut (46) from one of the vibration mount studs (47); remove the vibration mount stud.

(4) Disassemble the lockwasher (48), vibration mount limit stop (49), flat washer (50), vibration mount (51), flat washer (52), and vibration mount limit stop (53).

(5) Repeat (3) and (4) above to disassemble the three remaining vibration mounts.

b. Reassembly.

(1) Assemble a vibration mount limit stop (53), flat washer (52), vibration mount (51), flat washer (50), and vibration mount limit stop (49).

(2) Insert a vibration mount stud (47) through the assembly; install a lockwasher (48) and plain hexagonal nut (46) on the stud.

(3) Repeat (1) and (2) above to reassemble the remaining three vibration mounts.

(4) Position the four vibration mounts on the printer base (74); secure each with four machine screws (44) and lockwashers (45).

(5) Replace the page printer on the printer base as described in paragraph 152*b*.

225. Disassembly and Reassembly of Dust Cover Arms and Guides

(fig. 247)

a. Disassembly.

(1) Remove the dust cover arm spring (23) from the spring post on one of the dust cover arms (28) and from the spring post (39) on the printer base (74).

(2) Remove the machine screw (24), nut plate (25), and flat washer (26) that hold a locking knob (27) to the dust cover arm (28); remove the dust cover knob.

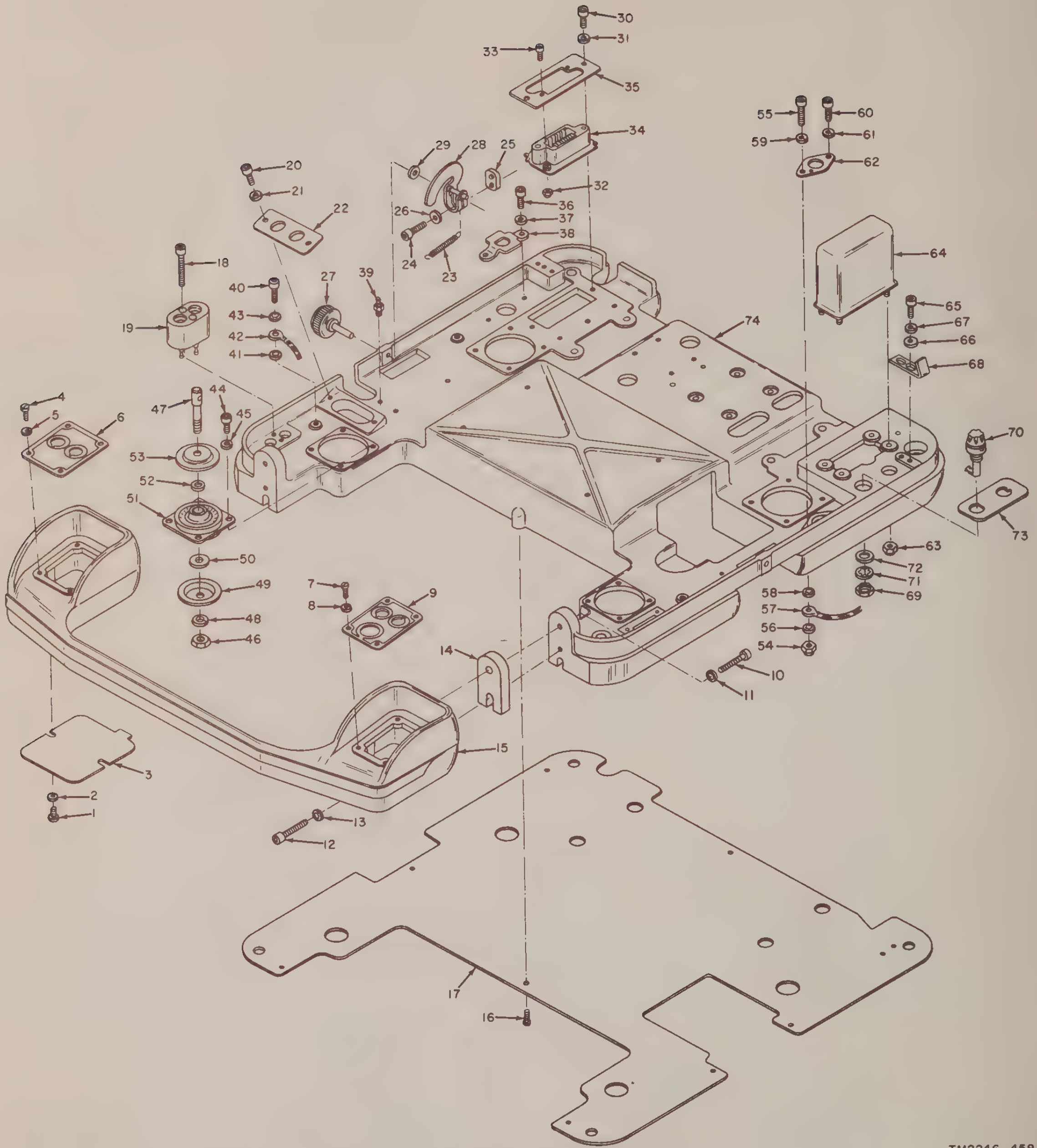

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Figure 247. Page printer base; exploded view.

1 Machine screw, 10393
2 Lockwasher, 10429
3 Cover plate, 53171
4 Machine screw, 10393
5 Lockwasher, 10429
6 Switch plate, 52998
7 Machine screw, 10393
8 Lockwasher, 10429
9 Switch plate, 54661
10 Machine screw, 10013–01
11 Lockwasher, 10404
12 Machine screw, 10013–01
13 Lockwasher, 10404
14 Spacer plate, 54952
15 Keyboard guard, 52997
16 Machine screw, 10179
17 Printer base plate, 53421
18 Machine screw, 10013
19 Receptacle connector, 53320A
20 Machine screw, 10008
21 Lockwasher, 10430
22 Switch plate, 53563
23 Dust cover arm spring, 55014
24 Machine screw, 10010
25 Nut plate, 52073
26 Flat washer, 10467
27 Locking knob, 55013
28 Dust cover arm, 55010A (LH) and 55015A (RH)
29 Flat washer, 50315
30 Machine screw, 10008
31 Lockwasher, 10430
32 Self-locking hexagonal nut, 10550
33 Machine screw, 10056
34 Receptacle connector (J7), 20263
35 Mounting plate, 53092
36 Machine screw, 10008
37 Lockwasher, 10430
38 Mounting bracket, 53806
39 Spring post, 50649
40 Machine screw, 10008
41 Lock washer, 10404
42 Grounding lead, 53651A
43 Lock washer, 10404
44 Machine screw, 10008
45 Lock washer, 10430
46 Plain hexagonal nut, 10502
47 Vibration mount stud, 53557
48 Lockwasher, 10427
49 Vibration mount limit stop, 54127
50 Flat washer, 50862
51 Vibration mount, 10911
52 Flatwasher, 50494
53 Vibration mount limit stop, 54127
54 Self-locking hexagonal nut, 10501
55 Machine screw, 10010
56 Lockwasher, 10404
57 Terminal lug, 20838
58 Lockwasher, 10404
59 Lockwasher, 10430
60 Machine screw, 10008
61 Lockwasher, 10430
62 Mounting plate, 53172
63 Self-locking hexagonal nut, 10501
64 Motor stop relay (E1), 20301A
65 Machine screw, 10008
66 Flat washer, 10467
67 Lockwasher, 10430
68 Dust cover guide, 55021
69 Hexagonal nut
70 Fuse holder (F1), 20458 (includes items 69, 71, and 72)
71 Lockwasher
72 Rubber washer
73 Switch plate (S4), 53563
74 Printer base, 55780

Figure 247—Continued.

(3) Remove the flat washer (29) and dust cover arm from the printer base (74).

(4) Repeat (1) through (3) above to similarly disassemble the opposite dust cover arm.

(5) Remove the four machine screws (65), flat washers (66), and lockwashers (67) that hold the two dust cover guides (68) to the printer base (74); remove the dust cover guides.

(6) Remove the spring post (39) from the printer base (74).

b. Reassembly.

(1) Install the spring post (39) on the printer base (74).

(2) Position the two dust cover guides (68) on the printer base (74); secure with four machine screws (65), lockwashers (67), and flat washers (66).

(3) Position the dust cover arm (28) and flat washer (29) on the printer base (74); install the locking knob (27).

(4) Secure the locking knob (27) to the dust cover arm (28) with a machine screw (24), nut plate (25), and flat washer (26).

(5) Install a dust cover arm spring (23) on the dust cover arm (28) and on the spring post on the printer base (74).

(6) Repeat (3) through (5) above to install the opposite dust cover arm.

226. Disassembly and Reassembly of Printer Base Components

(fig. 247)

a. Disassembly.

(1) Remove the page printer from the printer base as described in paragraph 152*a*.

(2) Remove the eight machine screws (16) that hold the printer base plate (17) to the printer base (74); remove the printer base plate.

(3) Remove the four self-locking hexagonal nuts (63) that hold the motor-stop relay (64) to the printer base; disconnect the electrical leads and remove the motor stop relay.

(4) Remove the hexagonal nut (69) that holds the fuse holder (70) to the switch plate (73); disconnect the electrical leads and remove the fuse holder (70), lockwasher (71), and rubber washer (72). Remove the hexagonal nut that holds the toggle switch to the switch plate; remove the switch plate (73).

(5) Remove the two machine screws (18) that hold the receptacle connector (19) to the printer base (74); unsolder the leads and remove the receptacle connector.

(6) Remove the two machine screws (20) and

lockwashers (21) that hold the switch plate (22) to the printer base (74); unsolder the electrical leads from the selector magnet and keyboard jacks and remove the switch plate.

(7) Remove the two machine screws (36) and lockwashers (37) that hold the mounting bracket (38) to the printer base (74); unsolder the leads from the fuse holder and remove the bracket.

(8) Remove the two machine screws (30) and lockwashers (31) that hold the receptacle connector (34) and mounting plate (35) to the printer base (74); disconnect the electrical leads and remove the assembled receptacle connector and mounting plate. Remove the two self-locking hexagonal nuts (32) and machine screws (33) that hold the receptacle connector to the mounting plate; remove the receptacle connector.

(9) Remove the self-locking hexagonal nut (54), machine screw (55), lockwasher (56), terminal lug (57), lockwasher (58), and lockwasher (59) that hold the one side of the mounting plate (62) to the printer base. Remove the machine screw (60) and lockwasher (61) that hold the other side of the mounting plate to the printer base; unsolder the leads to the motor stop switch jack and remove the mounting plate.

(10) Remove the four machine screws (40) that hold the grounding leads (42) to the printer base (74); remove the four grounding leads and eight lockwashers (41 and 43).

b. Reassembly.

(1) Position four lockwashers (41), grounding leads (42), and lockwashers (43) on the printer base (74); secure with four machine screws (40).

(2) Position the motor-stop switch jack on the mounting plate (62) and connect the electrical leads to the jack. Position the mounting plate on the printer base (74); secure the rear side with a machine screw (60) and lockwasher (61). Secure the front side with a machine screw (55), lockwasher (59), lockwasher (58), terminal lug (57), lockwasher (56), and self-locking hexagonal nut (54).

(3) Position the receptacle connector (34) on the mounting plate (35); secure with two machine screws (33) and self-locking hexagonal nuts (32). Solder the electrical leads to the receptacle connector. Position the assembled receptacle connector and mounting plate on the printer base; secure with two machine screws (30) and lockwashers (31).

(4) Position the fuse holder on the mounting bracket (38) and solder the electrical leads. Position the mounting bracket on the printer base (74) and secure with two machine screws (36) and lockwashers (37).

(5) Position the keyboard and selector magnet jacks on the switch plate (22) and solder the electrical leads to the jacks. Position the assembled switch plate and jacks on the printer base (74); secure with two machine screws (20) and lockwashers (21).

(6) Position the receptacle connector (19) on the printer base (74); solder the electrical leads to the receptacle connector. Secure the receptacle connector to the printer base with two machine screws (18).

(7) Position the toggle switch on the switch plate (73); secure with a hexagonal nut. Position the fuse holder (70) on the switch plate. Position the switch plate on the printer base; secure with a rubber washer (72), lockwasher (71), and a plain hexagonal nut (69). Connect the electrical leads to the fuse holder.

(8) Position the motor-stop relay (64) on the printer base (74); secure with four self-locking hexagonal nuts (63). Connect the electrical leads to the motor-stop relay.

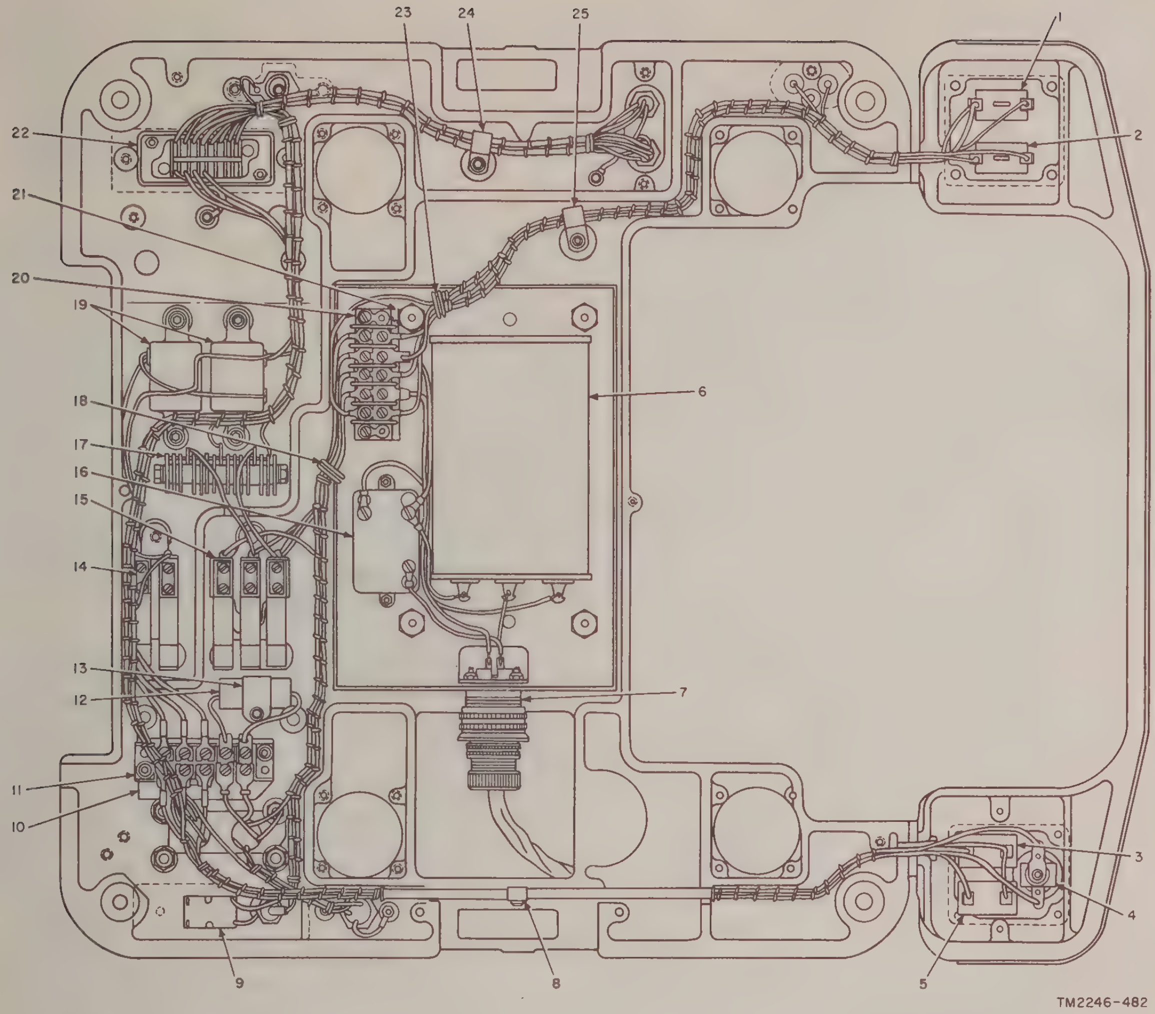
(9) Position the printer base plate (17) on the printer base (74); secure with eight machine screws (16).

(10) Install the page printer on the printer base as described in paragraph 152*b*.

227. Removal and Replacement of Printer Base Electric Components

(fig. 248)

The electrical components mounted in the printer base are illustrated in figure 248. These components should not be removed unless they are damaged or inoperative. Reference numbers are shown on the legend which accompanies the illustration.



1	Toggle switch (S5), 20119
2	Toggle switch (S6), 20119
3	Toggle switch (S3), 20116
4	Lamp socket (I3), 20790 Lamp, 20791
5	Toggle switch (S2), 20119
6	Capacitor (C9), 53343
7	Receptacle connector (P3, J3), 20264
8	Electrical clamp, 20503
9	Toggle switch (S4), 20115
10	Mounting plate, 20382
11	Terminal board (TB9), 20385
12	Capacitor (C2), 20212
13	Electrical clamp, 20508
14	Electrical contact (J4B), 53416A
15	Electrical contact (J4), 53414
16	Motor start relay (E3), 20114
17	Metallic rectifier (CR1), 54356
18	Bushing insulator, 20726
19	Capacitor (C5 and C6), 20213
20	Terminal board (TB1), 20370
21	Mounting plate, 20382
22	Receptacle connector (J7), 20263
23	Bushing insulator, 20726
24	Electrical clamp, 20514
25	Electrical clamp, 20513

Figure 248. Printer base electrical components.

Section VI. REMOVAL AND REPLACEMENT OF PERFORATOR COMPONENTS

228. General

a. Introduction.

(1) This section describes replacement procedures required to overhaul completely a defective or inoperative Reperforator-Transmitter TT–178/FG or TT–179/FG. Procedure includes replacement of all parts of the unit except those parts for which the procedure is so simple that it is obvious.

(2) Except for cases of extreme emergency, all repairs should be made by personnel thoroughly trained in teleprinter maintenance. Equipment operating with minor faults may fail completely as the result of efforts by inexperienced per-

sonnel to correct apparently simple defects.

(3) Follow the inspection, cleaning, and lubrication instructions given in paragraphs 130 through 144. Whenever repairs are made, the perforator should be completely adjusted in accordance with paragraphs 420 through 525.

b. General Disassembly and Reassembly Procedure. Paragraph 150 describes the procedure to be used when disassembling teleprinter equipment. Paragraph 151 describes the procedure to be used when reassembling teleprinter equipment. Refer to these paragraphs before beginning any overhaul or repair work on the perforator.

229. Removal and Replacement of Perforator Chassis

a. Removal.

(1) Disconnect the plug connections between the perforator base and the transmitter-distributor.

(2) Unscrew the motor plug connector from its coupling in the perforator base.

(3) Remove the selector-magnet plug from the jack in the perforator base.

(4) Remove the receiving multisolenoid plug from the jack in the perforator base.

(5) Remove the perforator latch plug and the pulsing contact assembly plug from the jacks in the perforator base.

(6) Remove the two machine screws (44, fig. 258) and lockwashers (45) that hold the tape guide (46) to the perforator frame; remove the tape guide.

(7) Remove the four machine screws, lockwashers, and grounding electrical leads that hold the perforator chassis to the perforator base; lift the chassis from the base.

b. Replacement.

(1) Position the perforator chassis on the vibration mounts on the perforator base; secure with four grounding leads, machine screws, and lockwashers.

(2) Position the tape guide (46) on the perforator frame; secure with two machine screws (44) and lockwashers (45).

(3) Install the perforator latch plug and pulsing contact assembly plug in the jacks in the perforator base.

(4) Install the receiving multisolenoid plug in the jack on the perforator base.

(5) Install the selector-magnet plug in the jack on the perforator base.

(6) Connect the motor plug connector to the coupling in the perforator base.

(7) Connect the plug from the transmitter-distributor to the jack in the perforator base.

230. Removal and Replacement of Transmitter-Distributor

a. Removal.

(1) Remove the transmitter-distributor plug from the jack in the perforator base.

(2) Snap off the outside cover of the transmitter-distributor.

(3) Remove the two machine screws and lockwashers that hold the transmitter-distributor frame to the perforator frame; remove the transmitter-distributor, carefully disengaging the friction clutch fork from the clutch driver.

b. Replacement.

(1) Position the transmitter-distributor on the perforator frame, carefully engaging the friction clutch fork with the clutch driver. Secure with two machine screws and lockwashers.

(2) Install the outside cover on the transmitter-distributor.

(3) Connect the transmitter-distributor plug to the jack on the perforator base.

231. Disassembly and Reassembly of Transmitter-Distributor Covers

(fig. 249)

a. Disassembly.

(1) Remove the transmitter-distributor as described in paragraph 230*a*.

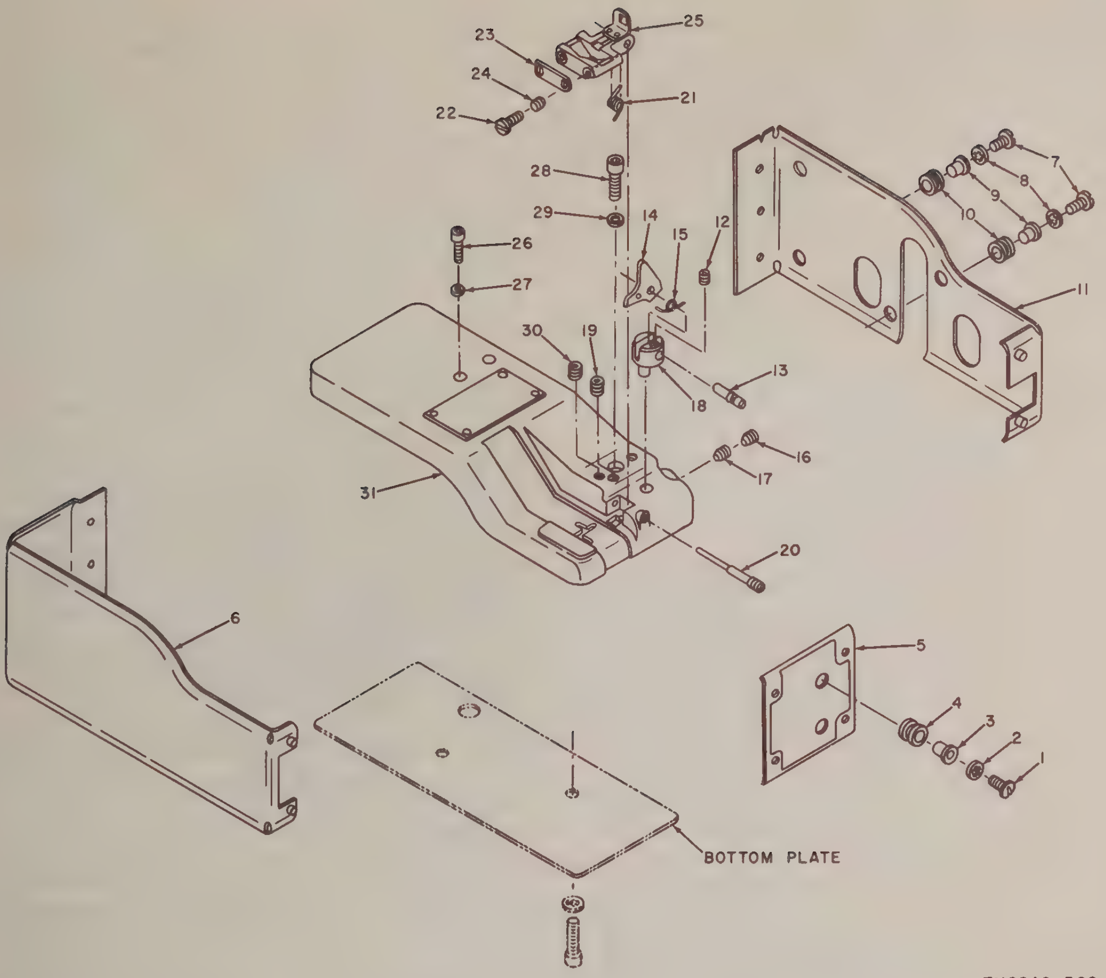
(2) Remove the two machine screws (1), internal tooth lockwashers (2), and bushings (3) that hold the front plate (5) to the frame of the transmitter-distributor; remove the front plate.

(3) Remove the two grommets (4) from the front plate (5).

(4) Remove the four machine screws (7), internal tooth lockwashers (8), and bushings (9) that hold the inside cover (11) to the frame of the transmitter-distributor; remove the inside cover.

(5) Remove the four grommets (10) from the inside cover (11).

(6) Remove the setscrews (12) and the tape



1	Machine screw, 10357
2	Lockwasher, 10403
3	Bushing, 52860
4	Grommet, 20725
5	Front plate, 52853
6	Outside cover, 53796A
7	Machine screw, 10393
8	Lockwasher, 10403
9	Bushing, 52860
10	Grommet, 20725
11	Inside cover, 53795
12	Setscrew, 10221
13	Tape cover latch, 53952
14	Tape cover latch, 56322
15	Tape cover latch spring, 56323
16	Setscrew, 10217
17	Setscrew, 10217
18	Pivot, 56320
19	Setscrew, 10209
20	Pin, 53849
21	Tape cover spring, 56324
22	Adjustment screw, 52884
23	Tape guide, 52809
24	Setscrew, 10221
25	Tape cover, 56801A
26	Machine screw, 10003
27	Lockwasher, 10429
28	Machine screw, 10006
29	Lockwasher, 10429
30	Setscrew, 10224
31	Top cover, 53794

Figure 249. Transmitter-distributor covers, exploded view.

cover latch (13) from the pivot post (18); lift the tape cover latch (14) and the tape cover latch spring (15) from the pivot post.

(7) Remove the setscrews (16 and 17) that hold the pivot post (18) in the top cover (31); remove the pivot post.

(8) Remove the setscrew (19) that holds the pin (20) in the top cover (31); remove the pin. Remove the tape cover (25) and the tape cover spring (21) from the top cover.

(9) Remove the two adjustment screws (22) and setscrews (24) that hold the tape

guide (23) on the tape cover (25); remove the tape guide.

(10) Remove the two machine screws (26, lockwashers (27), machine screw (28), and lockwasher (29) that hold the top cover (31) to the frame; remove the top cover.

(11) Remove the two setscrews (30) from the top cover (31).

b. Reassembly.

(1) Install the two setscrews (30) in the top cover (31).

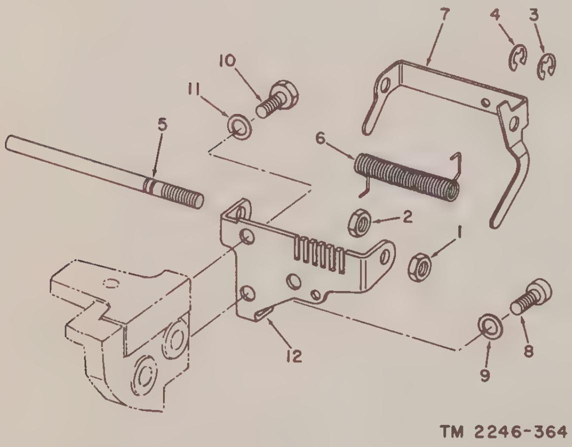
(2) Position the top cover (31) on the frame of the transmitter-distributor; hold with a lockwasher (29), machine screw (28), two lockwashers (27), and two machine screws (26).

(3) Install two setscrews (24) in the tape cover (25).

(4) Position the tape guide (23) on the tape cover (25); hold with two adjustment screws (22).

(5) Position the tape cover (25) and the tape cover spring (21) on the top cover (31); insert the pin (20). Secure the pin with a setscrew (19).

(6) Position the pivot post (18) in the top cover (31); hold the pivot post in place with setscrews (17 and 16).



1	Plain hexagonal nut, 10504
2	Plain hexagonal nut, 10504
3	Retainer ring, 10969
4	Retainer ring, 10969
5	Tape-out lever pivot shaft, 52718
6	Tape-out lever spring, 53156
7	Tape-out lever, 52824
8	Machine screw, 10003
9	Lockwasher, 10429
10	Machine screw, 10398
11	Lockwasher, 10429
12	Code sensing lever guide, 52861

Figure 250. Tape-out sensing mechanism, exploded view.

(7) Position the tape cover latch spring (15) and the tape cover latch (14) in the pivot post (18); install the tape cover latch (13). Hold the tape cover latch in place with a setscrew (12).

(8) Install the four grommets (10) in the inside cover (11).

(9) Position the inside cover on the frame of the transmitter-distributor; hold in place with four bushings (9), lockwashers (8), and machine screws (7).

(10) Install the two grommets (4) in the front plate (5).

(11) Position the front plate (5) on the inside cover (11) and outside cover (6); hold to the frame of the transmitter-distributor with two bushings (3), internal tooth lockwashers (2), and machine screws (1).

(12) Adjust the transmitter-distributor as described in paragraphs 507 through 520.

(13) Install the transmitter-distributor as described in paragraph 230*b*.

232. Disassembly and Reassembly of Tape-out Sensing Mechanism

(fig. 250)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the two plain hexagonal nuts (1 and 2) from the tape-out lever pivot shaft (5).

(4) Remove the two retainer rings (3 and 4) that hold the tape-out lever (7) in place on the tape-out lever pivot shaft (5); slide the tape-out lever pivot shaft from the code sensing lever guide (12), removing the tape-out lever spring (6) and the tape-out lever.

(5) Remove the machine screw (8), lockwasher (9), machine screw (10), and lockwasher (11) that hold the code sensing lever guide (12) to the frame of the transmitter-distributor; remove the code sensing lever guide.

b. Reassembly.

(1) Position the code sensing lever guide (12)

on the frame of the transmitter-distributor; hold with a lockwasher (11), machine screw (10), lockwasher (9), and machine screw (8).

(2) Position the tape-out lever (7) and the tape-out lever spring (6) on the code sensing lever guide; slide the tape-out lever pivot shaft (5) through the guide, spring, and plain hexagonal nut (2), guide, and plain hexagonal nut (1). Turn the nuts on the shaft threads.

(3) Hold the tape-out lever (7) in place on the tape-out lever pivot shaft (5) with two retainer rings (4 and 3).

(4) Adjust the transmitter-distributor as described in paragraphs 507 through 520.

(5) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(6) Install the transmitter-distributor on the perforator as described in paragraph 230*b*.

233. Disassembly and Reassembly of the Transmitter-Distributor Operating Levers

(fig. 251)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the retainer ring (1) that holds the tight-tape lever (2) to the pivot post on the frame; remove the tight-tape lever.

(4) Remove the retainer ring (3) that holds the upper switch bail lever (4) to the pivot post on the frame; remove the upper switch bail lever.

(5) Remove the self-locking hexagonal nut (5) machine screw (6), machine screw (7), and flat washer (8) that attach the start-stop switch (11) to the frame of the transmitter-distributor, remove the start-stop switch from the frame.

(6) Remove the machine screw (9) and lockwasher (10) that attach the electrical clamp (13) to the frame.

(7) Unsolder the ends of the two wires in the wiring harness (12) from the solder lugs on the stop-start switch (11); tag the wires and remove the stop-start switch.

(8) Disconnect the terminal lugs of the wires at the other end of the wiring harness from the terminal board; remove the wiring harness and the electrical clamp.

(9) Remove the retainer ring (14) that holds the stop-start lever (15) to the pivot stud on the frame; remove the stop-start lever.

(10) Remove the retainer rings (16 and 17) from the pin (18); remove the pin from the lower switch bail lever (19) and from the frame. Remove the lower switch bail lever.

(11) Remove the start-stop lever detent spring (20) from the start-stop lever detent (22) and from the spring post on the frame.

(12) Remove the retainer ring (21) and the stop-start lever detent (22) from the pivot post.

b. Reassembly.

(1) Position the stop-start lever detent (22) on the pivot post on the frame; hold with the retainer ring (21).

(2) Install the stop-start lever detent spring (20) on the stop-start lever detent (22) and on the spring post on the frame.

(3) Position the lower switch bail lever (19) on the frame. Slide the pin (18) through the lower switch bail lever and through the frame; hold in place with two retainer rings (17 and 16).

(4) Position the stop-start lever (15) on the pivot stud attached to the frame; hold with a retainer ring (14).

(5) Install the electrical clamp (13) on the wiring harness (12). Connect the terminal lugs of the two wires of the wiring harness to the proper terminals of the terminal board.

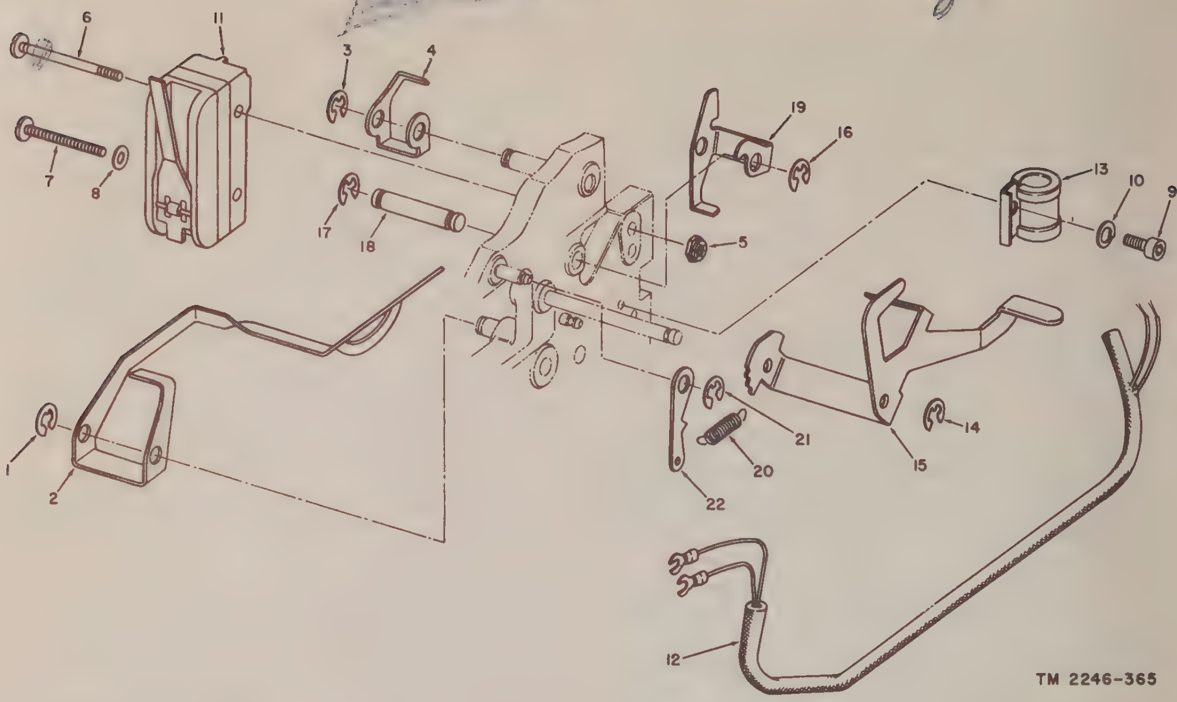
(6) Solder the ends of the two wires in the wiring harness to the proper solder lugs on the stop-start switch (11).

(7) Position the electrical clamp (13) on the frame; hold with a lockwasher (10) and machine screw (9).

(8) Position the stop-start switch on the frame; hold with a flat washer (8), machine screw (7), machine screw (6), and self-locking hexagonal nut (5).

(9) Position the upper switch bail lever (4) on the pivot post on the frame; hold with a retainer ring (3).

(10) Position the tight-tape lever (2) on the



1	Retainer ring, 10949
2	Slack-tape lever, 52810
3	Retainer ring, 10949
4	Upper switch bail lever, 52811
5	Self-locking hexagonal nut, 10500
6	Machine screw, 10385
7	Machine screw, 10359
8	Flat washer, 10459
9	Machine screw, 10003
10	Lockwasher, 10429
11	Start-stop switch (S17), 20108
12	Wiring harness, 53339
13	Electrical clamp, 20507
14	Retainer ring, 10949
15	Stop-start lever, 52863
16	Retainer ring, 10949
17	Retainer ring, 10949
18	Pin, 52872
19	Lower switch bail lever, 52812
20	Start-stop lever detent spring, 53149
21	Retainer ring, 10949
22	Start-stop lever detent, 50404

Figure 251. Transmitter-Distributor operating levers, exploded view.

pivot post on the frame; hold with a retainer ring (1).

(11) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(12) Install the transmitter-distributor as described in paragraph 230*b*.

234. Disassembly and Reassembly of Transmitter-Distributor Code Sensing Levers

(fig. 252)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the five code sensing lever springs (1) from the code sensing levers (16, 17, 18, 20, and 21) and from the code sensing lever spring post (5).

(4) Remove the tape feed retracting lever spring (2) from the tape feed retracting lever (14) and from the code sensing lever spring post (5).

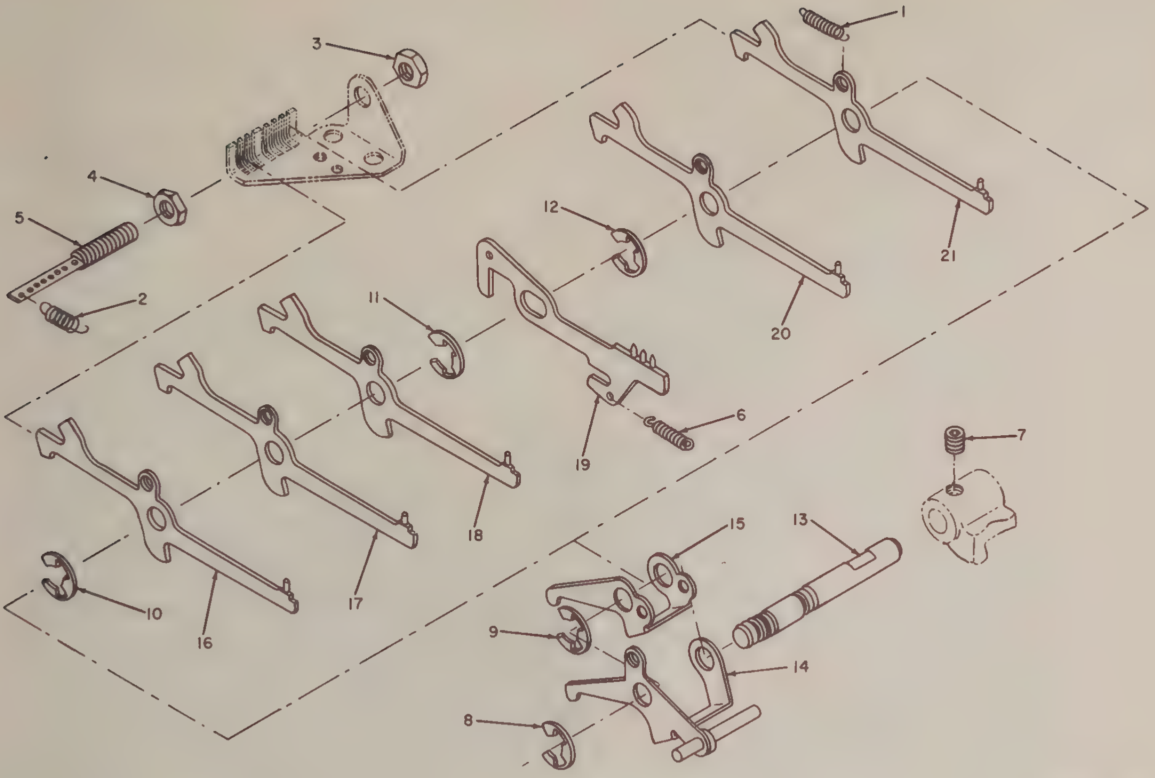
(5) Remove the plain hexagonal nuts (3 and 4) from the code sensing lever spring post (5); remove the code sensing lever spring post (5) from the selector lever comb guide.

(6) Remove the tape feed claw spring (6) from the tape feed claw (19) and from the lever guide.

(7) Remove the setscrew (7) that holds the code sensing lever stud (13) in the frame.

(8) Remove the retainer rings (8, 9, 10, 11, and 12) from the code sensing lever stud (13); slide the code sensing lever stud out of the code sensing levers and the frame.

(9) Remove the tape feed retracting lever (14), sensing lever restoring bail (15), code sensing levers (16, 17, 18, 20, and 21) and the tape feed claw (19) from the



1	Code sensing lever spring, 53152
2	Tape feed retracting lever spring, 53154
3	Plain hexagonal nut, 10509
4	Plain hexagonal nut, 10509
5	Code sensing lever spring post, 50325
6	Tape feed claw spring, 53153
7	Setscrew, 10209
8	Retainer ring, 10957
9	Retainer ring, 10957
10	Retainer ring, 10957
11	Retainer ring, 10957
12	Retainer ring, 10957
13	Code sensing lever stud, 52835
14	Tape feed retracting lever, 52829A
15	Sensing lever restoring bail, 52858
16	Code sensing lever, 52844
17	Code sensing lever, 52844
18	Code sensing lever, 52844
19	Tape feed claw, 52836
20	Code sensing lever, 52844
21	Code sensing lever, 52844

Figure 252. Transmitter-distributor code sensing levers, exploded view.

lever guides. Mark the position of the code sensing levers on the levers.

b. Reassembly.

(1) Position the tape feed claw (19) and the five code sensing levers (21, 20, 18, 17, and 16) on the sensing lever restoring bail (15), and the tape feed retracting lever (14); insert the code sensing lever stud (13) through the levers and into the hole in the frame of the transmitter-distributor.

(2) Install the retainer rings (12, 11, 10, 9, and 8).

(3) Hold the code sensing lever stud (13) in the frame with a setscrew (7).

(4) Hook the tape feed claw spring (6) on the tape feed claw (19) and on the lever guide.

(5) Install the plain hexagonal nut (4) on the code sensing lever spring post (5); install the post through the selector lever comb guide. Hold in place with a plain hexagonal nut (3).

(6) Hook the tape feed retracting lever spring (2) on the tape feed retracting lever (14) and on the selector spring post.

(7) Hook, the five code sensing lever springs (1) on the five code sensing levers (21, 20, 18, 17, and 16) and on the code sensing lever spring post (5).

(8) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(9) Install and adjust the transmitter-distributor on the perforator as described in paragraph 230*b*.

235. Disassembly and Reassembly of Transmitter-Distributor Selector Levers

(fig. 253)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the six selector lever springs (1) from the anchor post (38) and from the selector levers (4, 7, 10, 13, 16, and 19) and the camshaft stop lever (22).

(4) Remove the retainer ring (2) securing the selector levers to the selector lever stud (25). Remove the flat washers (3, 6, 9, 15, 18, and 21); the selector levers, and bearing shoes (5, 8, 11, 14, 17, and 20) alternately. Remove the spacer collar (12) in sequence. Remove the camshaft stop lever (22) and the sleeve bearing (23).

(5) Remove the setscrew (24) that holds the selector lever stud (25) in the frame; remove the selector lever stud.

(6) Remove the tape feed lever spring (26) from the tape feed lever (28) and from the spring post on the frame.

(7) Remove the retainer ring (27) holding the tape feed lever (28) to the tape feed lever stud (30); remove the tape feed lever.

(8) Remove the selector spring post as described in paragraph 228*a*(3) and (5).

(9) Remove the two machine screws (31) and lockwashers (32) from the selector lever comb (36); remove the selector lever comb from the frame.

(10) Remove the two machine screws (33), lockwashers (34), and the stop selector lever latch (35) from the selector lever comb (36).

(11) Remove the plain hexagonal nut (37) from the anchor post (38); remove the anchor post from the frame.

b. Reassembly.

(1) Install the anchor post (38) in the frame of the transmitter-distributor; hold with a plain hexagonal nut (37).

(2) Position the stop selector lever latch (35) on the selector lever comb (36); hold with two lockwashers (34) and machine screws (33).

(3) Position the selector lever comb on the frame of the transmitter-distributor; attach with two lockwashers (32) and machine screws (31).

(4) Insert the tape feed lever stud (30) in the hole in the frame; hold with a setscrew (29).

(5) Slide the tape feed lever (28) on the tape feed lever stud (30); hold with a retainer ring (27).

(6) Install the tape feed lever spring (26) on the tape feed lever (28) and on the spring stud on the frame.

(7) Insert the selector lever stud (25) in the hole of the frame; hold with a setscrew (24).

(8) Place the sleeve bearing (23) on the selector lever stud (25); position the camshaft stop lever (22) on the sleeve bearing (23).

(9) Install a flat washer (21), bearing shoe (20), selector lever (19), flat washer (18), bearing shoe (17), selector lever (16), flat washer (15), bearing shoe (14), selector lever (13), spacer collar (12), and the remaining bearing shoes (11, 8, and 5), selector levers (10, 7, and 4), and flat washers (9, 6, and 3) on the selector lever stud; secure with a retainer ring (2).

(10) Hook the seven selector lever springs (1) on the anchor post (38) and on the six selector levers and the camshaft stop lever (22).

(11) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(12) Install and adjust the transmitter-distributor on the perforator as described in paragraph 230*b*.

236. Disassembly and Reassembly of Transmitter-Distributor Camshaft

(fig. 254)

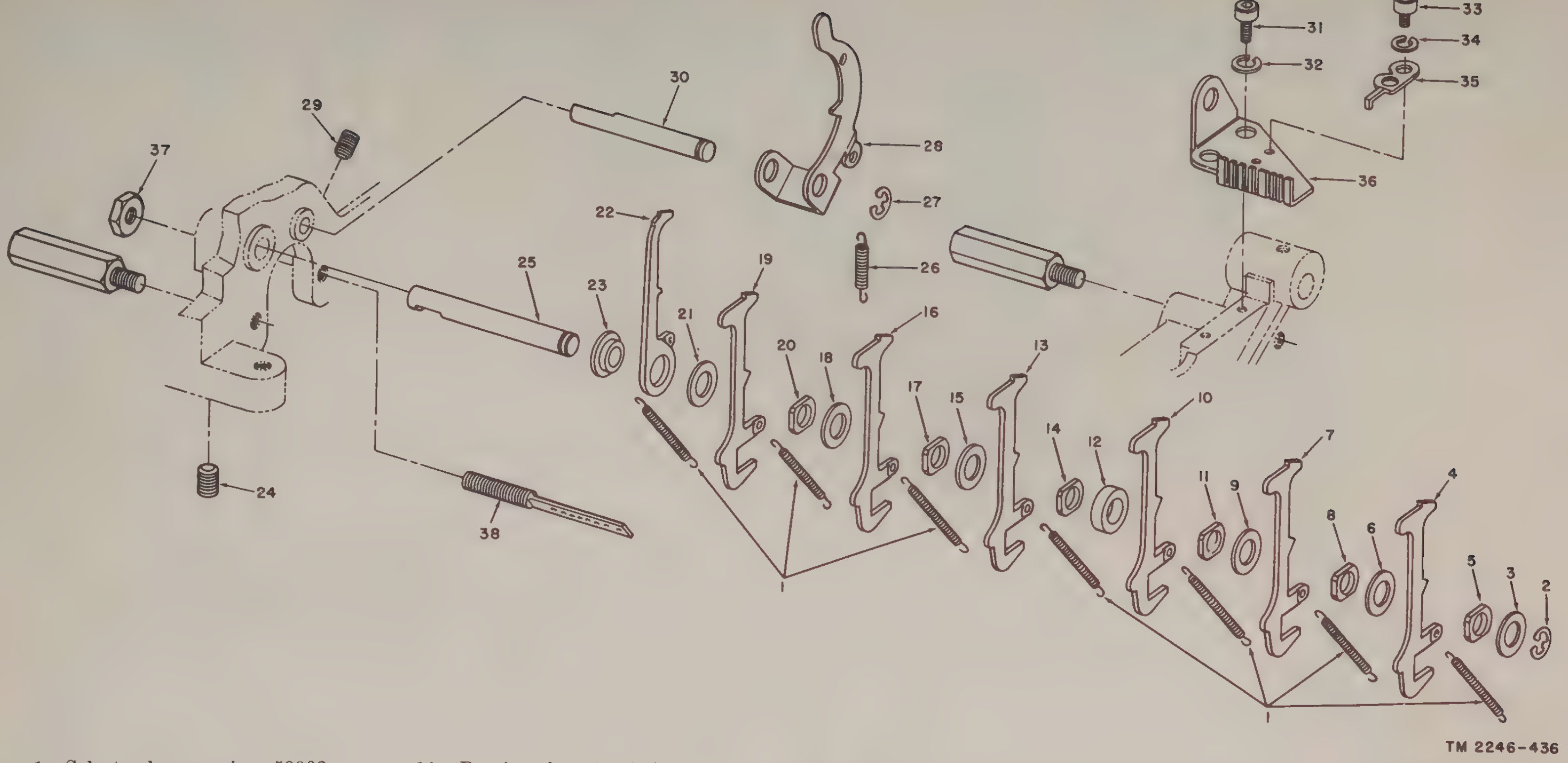
a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

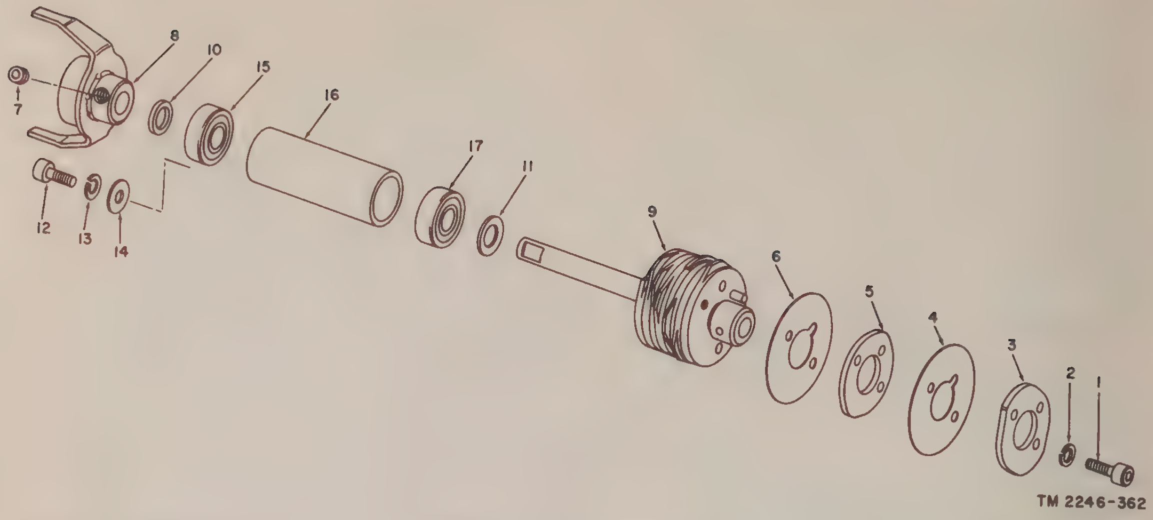
(3) Remove the selector levers as described in paragraph 235*a*.

(4) Remove the two machine screws (1) and lockwashers (2) that hold the tape feed retracting lever cam (3), flat washer (4),



1	Selector lever spring, 50902
2	Retainer ring, 10949
3	Flat washer, 50147
4	Selector lever, 51598A
5	Bearing shoe, 51644A
6	Flat washer, 50147
7	Selector lever, 51598A
8	Bearing shoe, 51644A
9	Flat washer, 50147
10	Selector lever, 51598A
11	Bearing shoe, 51644A
12	Spacer collar, 52833
13	Selector lever, 51598A
14	Bearing shoe, 51644A
15	Flat washer, 50147
16	Selector lever, 51598A
17	Bearing shoe, 51644A
18	Flat washer, 50147
19	Selector lever, 51598A
20	Bearing shoe, 51644A
21	Flat washer, 50147
22	Camshaft stop lever, 53613
23	Sleeve bearing, 52834
24	Setscrew, 10210
25	Selector lever stud, 52840
26	Tape feed lever spring, 53149
27	Retainer ring, 10949
28	Tape feed lever, 52845
29	Setscrew, 10210
30	Tape feed lever stud, 52842
31	Machine screw, 10003
32	Lockwasher, 10429
33	Machine screw, 10002
34	Lockwasher, 10429
35	Stop selector lever latch, 51594
36	Selector lever comb, 52841
37	Plain hexagonal nut, 10509
38	Anchor post, 50325

Figure 253. Transmitter-distributor selector levers, exploded view.



1	Machine screw, 10004
2	Lockwasher, 10429
3	Tape feed retracting lever cam, 52867
4	Flat washer, 52865
5	Sensing lever restoring cam, 52868
6	Flat washer, 52865
7	Setscrew, 10209
8	Friction clutch fork, 50484A
9	Transmitter-distributor camshaft, 52871
10	Flat washer, 51552
11	Flat washer, 52210
12	Machine screw, 10003
13	Lockwasher, 10429
14	Flat washer, 10450
15	Ball bearing 10753
16	Spacing collar, 52852
17	Ball bearing, 10753

Figure 254. Transmitter-distributor camshaft, exploded view.

sensing lever restoring cam (5), and flat washer (6) on the transmitter camshaft (9); remove the cams and flat washer from the transmitter camshaft.

(5) Remove the two setscrews (7) securing the friction clutch fork (8) to the transmitter camshaft (9); remove the friction clutch fork.

(6) Slide the transmitter camshaft (9) from the ball bearings in the frame; catch the flat washers (10 and 11).

(7) Remove the two machine screws (12), lockwashers (13), and flat washers (14) that hold the ball bearing (15) in the frame of the transmitter-distributor; remove the ball bearing, spacing collar (16), and ball bearing (17) from the frame.

b. Reassembly.

(1) Install the ball bearing (17), spacing collar (16), and ball bearing (15) in the frame of the transmitter-distributor.

(2) Hold the ball bearing (15) in the frame with two flat washers (14), lockwashers (13), and machine screws (12).

(3) Insert the transmitter camshaft (9) through the ball bearings in the frame, placing the flat washers (11 and 10) on each side of the frame.

(4) Position the friction clutch fork (8) on the transmitter camshaft (9); hold with two setscrews (7).

(5) Position the flat washer (6), sensing lever restoring cam (5), flat washer (4), and tape feed retracting lever cam (3) on the camshaft; hold with two lockwashers (2) and machine screws (1).

(6) Install the selector levers as described in paragraph 235*b*.

(7) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(8) Install and adjust the transmitter-distributor on the perforator as described in paragraph 230*b*.

237. Disassembly and Reassembly of Transmitter-Distributor Contacts

(fig. 255)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the two machine screws (1) and four lockwashers (2) that attach the

transmitter contact cover (3) to the transmitter-distributor frame; remove the transmitter contact cover.

(4) Remove the two machine screws (4) and lockwashers (5) that attach the contact holder mounting (15) to the frame.

(5) Unhook the transmitter contact bail spring (6) from the spring post on the contact holder mounting (15) and from the hole in the transmitter contact bail (9).

(6) Remove the machine screw (7), lockwasher (8), and the two electrical terminal lugs from the side of the contact holder mounting (15).

(7) Remove the two machine screws (10) and lockwashers (11) that attach the transmitter contact terminals (12) to the contact holder mounting (15).

(8) Unsolder the two spiraled electrical wires (14) from the top of the stationary contacts (13); remove the spiraled electrical wires and stationary contacts from the contact holder mounting (15).

(9) Remove the two stationary contacts (13) from the contact holder mounting (15).

(10) Remove the retainer ring securing the transmitter contact bail (9) to the post in the frame. Remove the transmitter contact bail.

b. Reassembly.

(1) Position the transmitter contact bail (9) on the post on the frame; hold with a retainer ring.

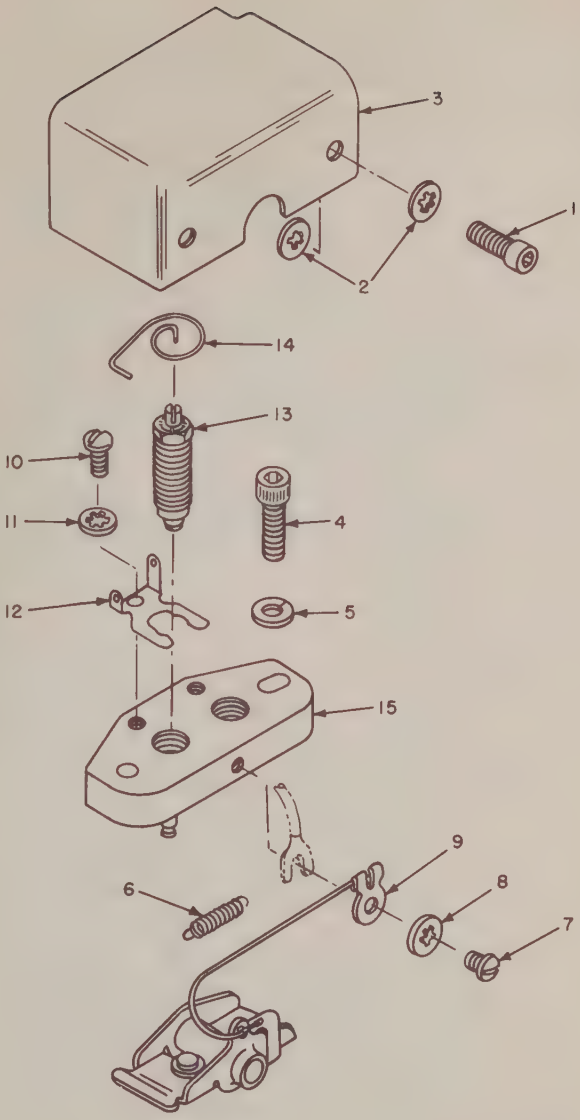
(2) Install the two stationary contacts (13) in the contact holder mounting (15) at approximately the correct contact spacing.

(3) Solder the electrical wires (14) in the slots in the top of the stationary contacts (13).

(4) Insert the transmitter contact terminals (12) in the threads of the stationary contacts (13), ½ to 1½ threads above the contact holder mounting (15); hold with two internal tooth lockwashers (11) and machine screws (10). Do not tighten the screws.

(5) Position the two electrical terminal lugs on the side of the contact holder mounting; hold with an internal tooth lockwasher (8) and the machine screw (7).

(6) Hook one end of the transmitter contact bail spring (6) in the hole in the transmitter contact bail (9) and the other end on the spring post on the contact holder mounting (15).



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1	Machine screw, 10001
2	Lockwasher, 10403
3	Transmitter contact cover, 53674
4	Machine screw, 10009
5	Lockwasher; 10403
6	Transmitter contact bail spring
7	Machine screw, 10301
8	Lockwasher, 10403
9	Transmitter contact bail E6, 51582A
10	Machine screw, 10301
11	Lockwasher, 10403
12	Transmitter contact terminal, 51597
13	Stationary contact (E6), 51588A
14	Electrical wire, 51610
15	Contact holder mounting, 51595A

Figure 255. Transmitter-distributor transmitter contacts, exploded view.

(7) Position the contact holder mounting (15) on the frame of the machine so that the contacts are in correct alinement; attach with two lockwashers (5) and machine screws (4).

(8) Position the transmitter contact cover (3) over the contact holder mounting (15); secure with two lockwashers (2) and machine screws (1).

(9) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(10) Install and adjust the transmitter-distributor on the perforator as described in paragraph 230*b*.

238. Disassembly and Reassembly of Transmitter-Distributor Clutch Magnet and Wiring

(fig. 256)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers as described in paragraph 231*a*.

(3) Remove the two machine screws (1) and lockwashers (2) that attach the bottom plate (9) to the frame of the transmitter-distributor.

(4) Remove the plain hexagonal nut (3), lockwasher (4), and machine screw (5) that hold the electrical clamp (6) and cable ground wire terminal to the terminal strip mounting bracket (23); remove the electrical clamp.

(5) Disconnect all wires from the terminal board (12); tag the wires.

(6) Pull the electrical cable (8) through the bushing insulator (7) and bottom plate (9).

(7) Push the bushing insulator (7) out of the bottom plate (9).

(8) Remove the four machine screws (10) and lockwashers (11) that attach the terminal board (12) and insulating strip (13) to the terminal strip mounting bracket (23); remove the terminal board and insulating strip.

(9) Remove the four machine screws (14) and lockwashers (15) that attach the electrical noise suppressor (16) to the filter box mounting bracket (22); remove the electrical noise suppressor.

(10) Remove the machine screw (17) and lockwasher (18) that hold the grounding lead (19) to the frame; remove the grounding lead (19).

(11) Remove the four machine screws (20) and lockwashers (21) that attach the filter box mounting bracket (22) and the terminal strip mounting bracket (23) to the frame; remove the two brackets.

(12) Remove the two machine screws (24) and lockwashers (25) that attach the clutch magnet (26) to the frame; remove the clutch magnet.

(13) Unhook the clutch magnet armature spring (27) from the armature (29) and from the spring stud on the frame.

(14) Remove the retainer ring (28) that attaches the clutch magnet armature (29) to the pivot stud on the frame of the transmitter-distributor; remove the clutch magnet armature.

(15) Remove the setscrew (30) that holds the eccentric stud (31) in the frame; remove the eccentric stud.

b. Reassembly.

(1) Insert the eccentric stud (31) in the frame of the transmitter-distributor; hold with a setscrew (30) but do not tighten securely.

(2) Position the clutch magnet armature (29) on the eccentric stud (31) and on the pivot stud in the frame; hold with a retainer ring (28).

(3) Hook the clutch magnet armature spring (27) to the clutch magnet armature (29) and the spring stud on the frame.

(4) Position the clutch magnet (26) on the frame; attach with two lockwashers (25) and machine screws (24).

(5) Position the terminal strip mounting bracket (23) and the filter box mounting bracket (22) on the frame of the transmitter-distributor; attach the brackets with four lockwashers (21) and machine screws (20).

(6) Position one end of the grounding lead (19) on the frame; attach with an internal tooth lockwasher (18) and machine screw (17).

(7) Position the electrical noise suppressor (16) in the filter box mounting bracket (22), hold with four lockwashers (15) and

machine screws (14). Place the free end of the grounding lead (19) between one lockwasher (15) and the frame.

(8) Position the insulating strip (13) and the terminal board (12) on the terminal strip mounting bracket (23); attach with four lockwashers (11) and machine screws (10).

(9) Install the bushing insulator (7) in the bottom plate (9).

(10) Insert the electrical cable (8) through the bushing insulator (7) and through the electrical clamp (6).

(11) Connect the electrical wires to the terminal board (12).

(12) Position the electrical clamp (6) and the cable ground wire terminal on the terminal strip mounting bracket (23); attach with a machine screw (5), lockwasher (4), and plain hexagonal nut (3).

(13) Position the bottom plate (9) on the frame of the transmitter-distributor; hold with two internal tooth lockwashers (2) and machine screws (1).

(14) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(15) Install and adjust the transmitter-distributor on the perforator as described in paragraph 230*b*.

239. Disassembly and Reassembly of Transmitter-distributor Frame

(fig. 257)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the covers from the transmitter-distributor as described in paragraph 231*a*.

(3) Remove the tape-out sensing mechanism as described in paragraph 232*a*.

(4) Remove the transmitter-distributor operating levers as described in paragraph 233*a*.

(5) Remove the transmitter-distributor code sensing levers as described in paragraph 234*a*.

(6) Remove the selector levers as described in paragraph 235*a*.

(7) Remove the transmitter-distributor camshaft as described in paragraph 236*a*.

(8) Remove the transmitter contacts as described in paragraph 237*a*.

(9) Remove the transmitter-distributor clutch magnet and wiring as described in paragraph 238*a*.

(10) Remove the two cover mounting posts (3) from the frame (12) of the transmitter-distributor.

b. Repair of Frame. If any of the spring posts or pivot posts are loose or damaged, replace the damaged post. Support the frame near the post to be removed to prevent distortion of the frame. Press the new post into the frame at a right angle to the plane of the frame. Replace a frame that has worn threads, enlarged holes, or is damaged.

c. Reassembly.

(1) Install the two cover mounting posts (3) in the frame (12) of the transmitter-distributor.

(2) Install the transmitter-distributor clutch latch wiring as described in paragraph 238*b*.

(3) Install the transmitter contacts as described in paragraph 237*b*.

(4) Install the transmitter-distributor camshaft as described in paragraph 236*b*.

(5) Install the selector levers as described in paragraph 235*b*.

(6) Install the transmitter-distributor code sensing levers as described in paragraph 234*b*.

(7) Install the transmitter-distributor operating levers as described in paragraph 233*b*.

(8) Install the end-of-tape sensing mechanism as described in paragraph 232*b*.

(9) Install the covers on the transmitter-distributor as described in paragraph 231*b*.

(10) Install and adjust the transmitter-distributor on the reperforator as described in paragraph 230*b*.

240. Removal and Replacement of Perforator Motor

a. Removal.

(1) Disconnect the motor plug connector from the receptacle connector in the perforator base.

(2) Remove the four machine screws (1, fig. 258) and lockwashers (2) that hold the gear case cover (3) to the gear case (8); remove the gear case cover and gear case cover gasket (4).

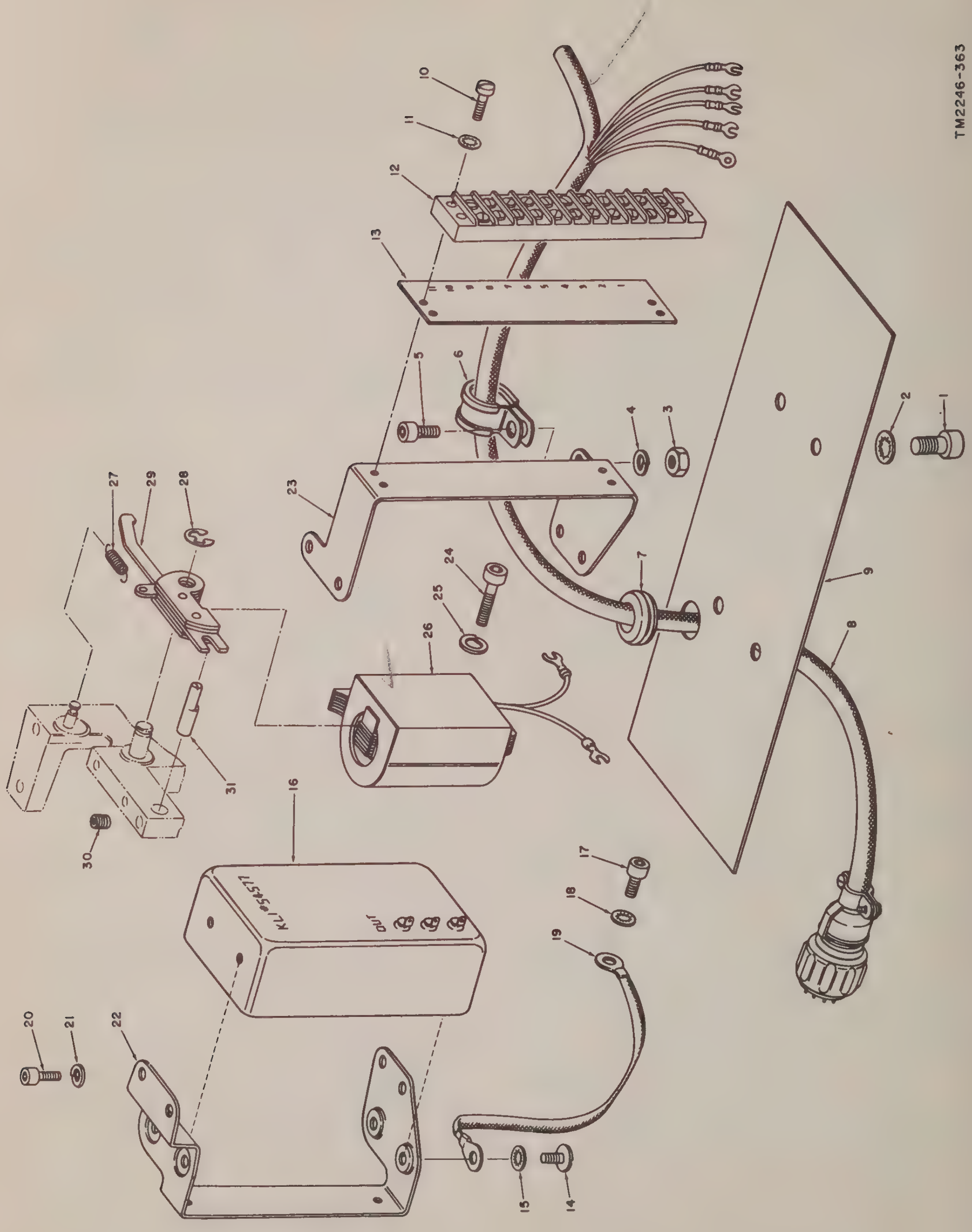
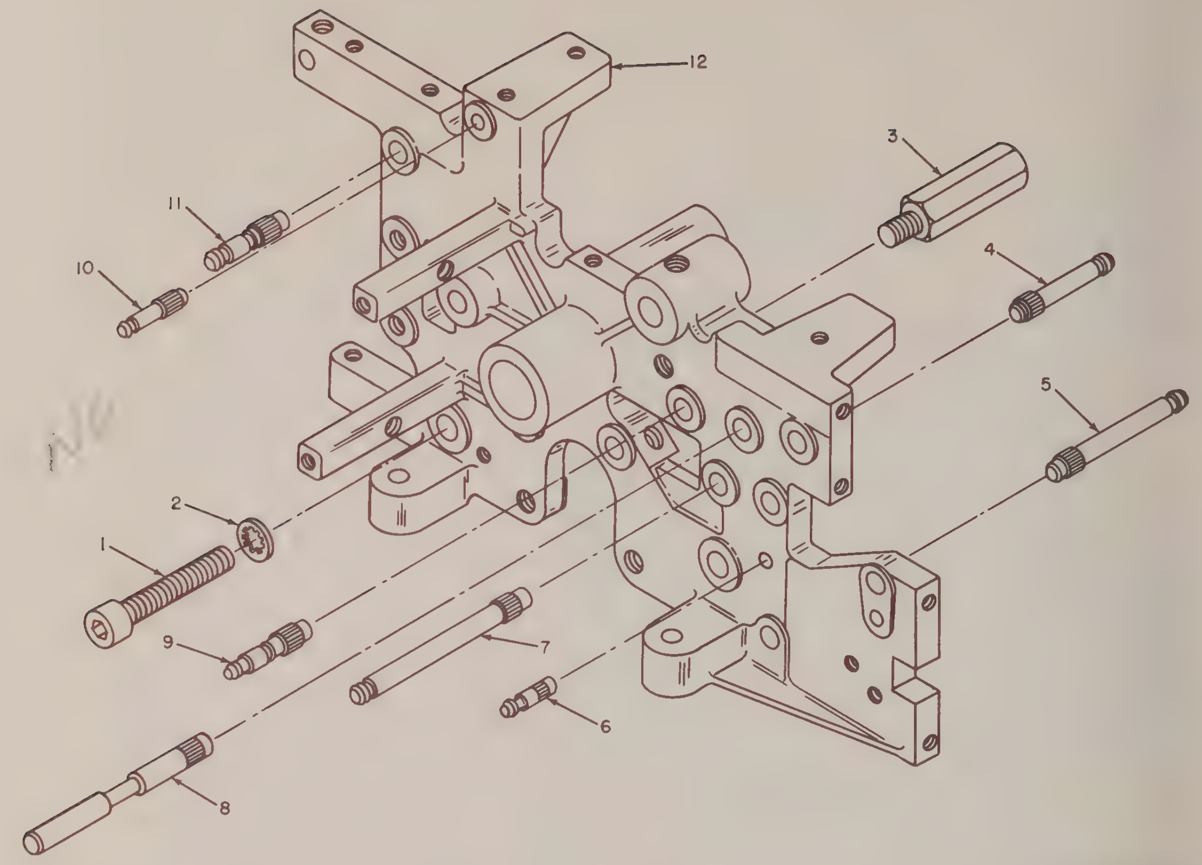


Figure 256. Transmitter-distributor clutch magnet and wiring, exploded view.

1 Machine screw, 10015
2 Lock washer, 10405
3 Plain hexagonal nut, 10512
4 Lockwasher, 10429
5 Machine screw, 10003
6 Electrical clamp, 20513
7 Bushing insulator 20726
8 Electrical cable, 53887A
9 Bottom plate, 53799
10 Machine screw, 10358
11 Lockwasher, 10408
12 Terminal board (TB5), 52135A
13 Insulating strip, 20380
14 Machine screw, 10301
15 Lockwasher, 10403
16 Electrical noise suppressor (23), 54577
17 Machine screw, 10003
18 Lockwasher, 10403
19 Grounding lead, 53789A
20 Machine screw, 10003
21 Lockwasher, 10429
22 Filter box mounting bracket, 52869
23 Terminal strip mounting bracket, 52866
24 Machine screw, 10010
25 Lockwasher, 10430
26 Clutch magnet E7, 53605A
27 Clutch magnet armature spring, 53155
28 Retainer ring, 10949
29 Clutch magnet armature, 52828A
30 Setscrew, 10203
31 Eccentric stud, 52838

Figure 256—Continued.



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1	Machine screw, 10030
2	Lockwasher, 10405
3	Post, 52851
4	Upper switch bail post, 52873
5	Tight tape stud, 52857
6	Spring post, 51133
7	Start-stop lever stud, 52854
8	Stop post, 52856
9	Detent lever stud, 52855
10	Spring post, 50455
11	Armature pivot stud, 52837
12	Frame, 52674

Figure 257. Transmitter-distributor frame, exploded view.

(3) Remove the four machine screws (1, fig. 210) and lockwashers (2) that hold the motor (38) to the perforator frame; move the drive end of the armature shaft out of the gear case far enough so that the worm gear clears the gear case.

b. Replacement.

(1) Position the motor (38, fig. 210) on the perforator so that the worm gear on the motor armature shaft meshes with the worm gear on the perforator main shaft; secure the motor to the perforator frame with four machine screws (1) and lockwashers (2).

(2) Position the gear case cover (3, fig. 258) and gasket (4) on the gear case (8); secure with four machine screws (1) and lockwashers (2).

(3) Connect the motor plug connector to the receptacle connector in the perforator base.

241. Disassembly, Reassembly, and Repair of Motor

a. Synchronous Motor. Disassemble and reassemble the synchronous motor as described in paragraph 169.

Note. Make sure the worm gear is correct for the operating speed desired (par. 29).

b. Series-Governed Motor. Disassemble and reassemble the series-governed motor as described in paragraph 170, see note in *a* above.

c. Repair and Service of Motor. Install brushes in the motor as described in paragraph 171. Repair the motor commutator as described in paragraph 172.

d. Motor-Governor. Disassemble and reassemble the governor of the series-governed motor as described in paragraph 173.

242. Dissassembly and Reassembly of Perforator Selector Magnet

(fig. 259)

a. Dissassembly

(1) Unplug the electrical cable and remove the two machine screws (1), flat washers (2), and lockwashers (3); remove the selector magnet assembly from the frame.

(2) Remove two machine screws (4) and lockwashers (5) holding the potentiometer mounting bracket (8) to the stud posts (14) and (18); remove the assembled potentiometer mounting bracket and potentiometer (13).

(3) Remove the locking nut (6) and plain hexagonal nut (7) holding the potentiometer (13) to the mounting bracket (8); remove the potentiometer.

(4) Push the tubing (12) from the solder lugs on the potentiometer (13); unsolder the electrical wires from the two solder lugs of the potentiometer (13) and from the two terminal posts on the selector magnet (21). Remove the tubing (11 and 12) and the electrical wires.

(5) Remove the stud post (14), electrical clamp (15), and lockwasher (16) from the selector magnet (21).

(6) Unsolder the electrical wires of the selector magnet cable (17) from the terminal posts on the selector magnet (21); remove the cable (17) from the selector magnet and electrical clamp (15).

(7) Remove the stud post (18), flat washer (19), and lockwasher (20) that hold the selector magnet (21) to the selector magnet bracket (39); remove the selector magnet and bracket (22).

(8) Remove the setscrew (23) that holds the bar magnet (24) in the selector magnet bracket; scratch mark the magnet and bracket before removing the bar magnet.

(9) Remove the setscrew (25) that holds the armature mounting shaft (28) in the selector magnet bracket (39).

(10) Remove the retainer rings (26 and 27) from the armature mounting shaft (28); remove the armature mounting shaft from the armature (29) and from the selector magnet bracket (39). Remove the armature.

(11) Remove the machine screw (30) and lockwasher (31) that hold the armature stop bracket (34) on the selector-magnet bracket (39); remove the assembled stop bracket and machine screws (32).

(12) Remove the two machine screws (32) and the plain hexagonal nuts (33) from the armature stop bracket (34). Remove the nuts from the machine screws.

(13) Remove the two armature leaf spring stop screws (35) and plain hexagonal nuts (36) from the selector-magnet bracket (39). Remove the nuts from the screws.

(14) Remove the setscrews (37 and 38) from the selector-magnet bracket (39).

b. Reassembly.

(1) Install the setscrews (38 and 37) in the selector magnet bracket (39) with the ends flush with the top surface of the bracket.

(2) Install two plain hexagonal nuts (36) on both armature leaf spring stop screws (35); install the screws (35) in the selector magnet bracket (39).

(3) Install two plain hexagonal nuts (33) on both machine screws (32); install the machine screws on the armature stop bracket (34).

(4) Position the armature stop bracket (34) on the selector magnet bracket; hold with a lockwasher (31) and machine screw (30).

(5) Position the armature (29) in the selector magnet bracket (39); insert the armature mounting shaft (28) through the bracket, armature, and armature stop bracket (34). Install the retainer rings (27 and 26) on the armature mounting shaft (28).

(6) Hold the armature mounting shaft (28) in the selector-magnet bracket (39) with a setscrew (25).

(7) Assemble the bar magnet (24) on the selector-magnet bracket (39), leaving an air gap of 0.015 inch between the south pole of the bar magnet and the end of the armature stop bracket (34) as instructed in paragraph 425; hold the bar magnet in place with a setscrew (23). The north pole of the bar magnet is designated by a red dot.

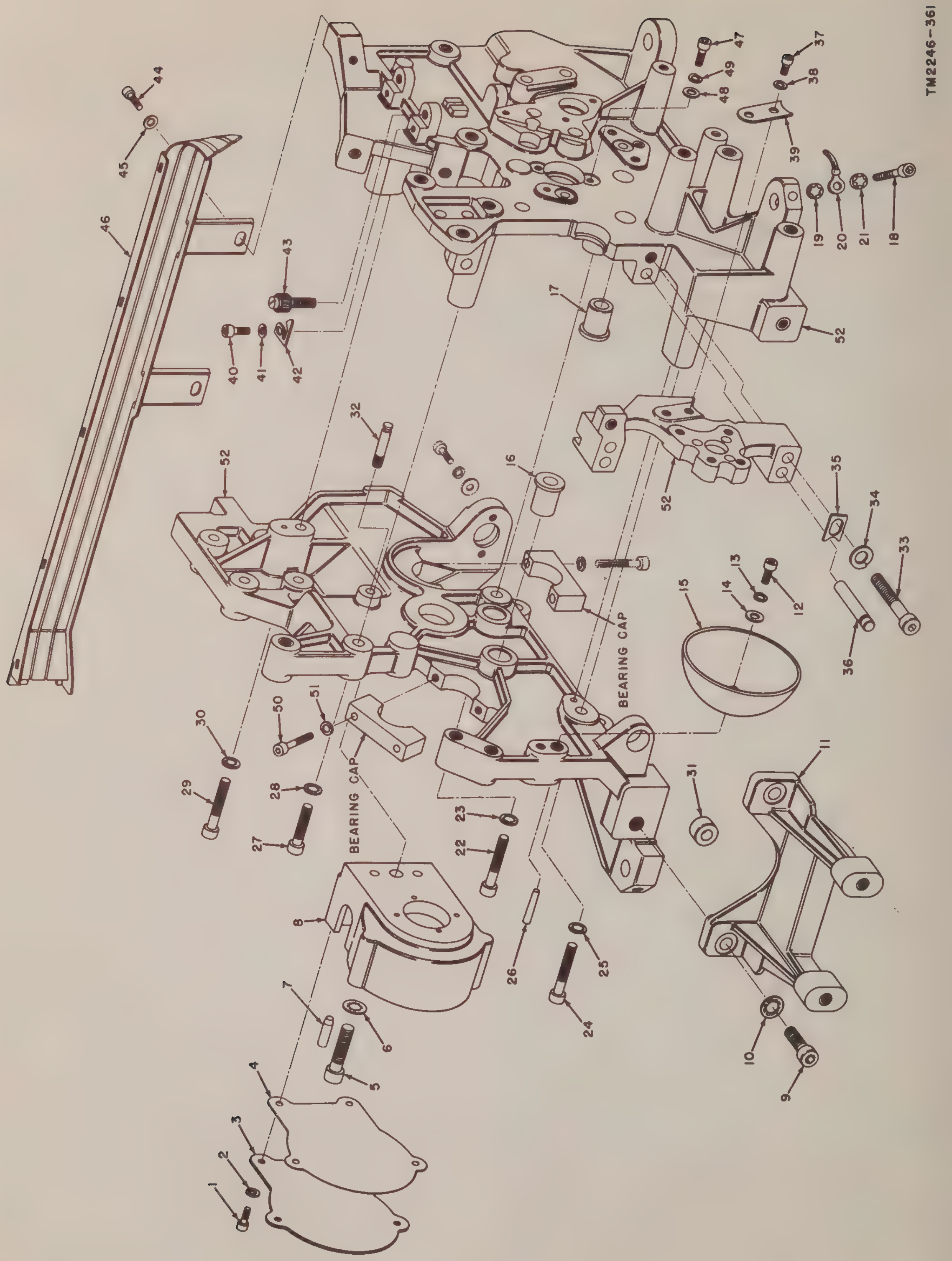

Figure 258. Perforator frame, exploded view.

1 Machine screw, 10004
2 Lockwasher, 10429
3 Gear case cover, 56064
4 Gasket 56063
5 Machine screw, 10021–01
6 Lockwasher, 10400
7 Dowel, 10916
8 Gear case, 56067
9 Machine screw, 10027
10 Lockwasher, 10400
11 XMTR support frame, 56146
12 Machine screw, 10008
13 Lockwasher, 10430
14 Flat washer, 10467
15 Signal bell, 51080
16 Bearing, 10729
17 Bearing, 10729
18 Machine screw, 10017–01
19 Lockwasher, 10405
20 Grounding strap
21 Lockwasher, 10405
22 Machine screw, 10030
23 Lockwasher, 10405
24 Machine screw, 10030
25 Lockwasher, 10405
26 Dowel, 10860
27 Machine screw, 10035
28 Lockwasher, 10405
29 Machine screw, 10030
30 Lockwasher, 10405
31 Bearing, 10727
32 Spring post, 54119
33 Machine screw, 10038
34 Lockwasher, 10427
35 Clip, 54713
36 Pin, 54714
37 Machine screw, 10003 (2 rqr)
38 Lockwasher, 10429
39 Bearing retainer, 56331
40 Machine screw, 10004 (2 rqr)
41 Lockwasher, 10429
42 Anchor plate, 52687
43 Selector magnet bracket adjustment screw, 52688
44 Machine screw, 10025
45 Lockwasher, 10430
46 Tape guide, 56055
47 Machine screw, 10004
48 Flat washer, 10405
49 Lockwasher, 10429
50 Machine screw, 10012
51 Lockwasher, 10430
52 Frame 54720A

Figure 258—Continued.

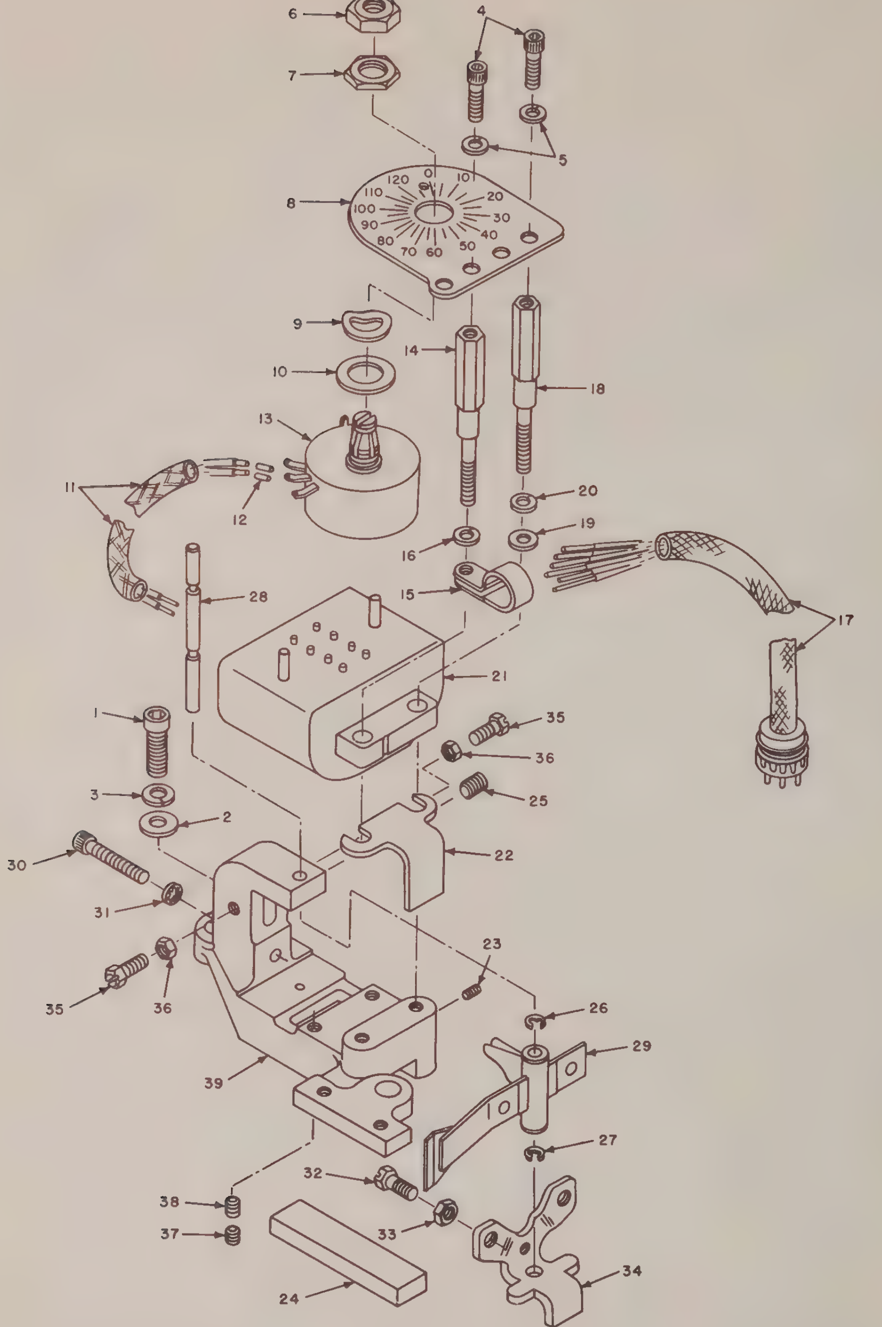

Figure 259. Perforator selector magnet, exploded view.

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(8) Position the bracket (22) on the selector-magnet bracket (39) and on the end of the bar magnet (24) for full surface contact.

(9) Position the selector magnet (21) on the selector-magnet bracket; hold the magnet bracket and the selector magnet with a lockwasher (20), flat washer (19), and the stud post (18).

(10) Solder the wires of the selector-magnet cable (17) to the terminal posts on the selector magnet (21).

1 Machine screw, 10018
2 Flat washer, 10464
3 Lockwasher, 10420
4 Machine screw, 10032
5 Lockwasher, 10430
6 Locking nut
7 Plain hexagonal nut, 10529
8 Potentiometer mounting bracket, 53333
9 Lockwasher, 10465
10 Flat washer, 10468
11 Tubing, 20837
12 Tubing, 20732
13 Potentiometer R24, (includes item 6)
14 Stud post, 53597
15 Electrical clamp, 20513
16 Lockwasher, 10430
17 Selector-magnet cable, 53545A
18 Stud post, 53597
19 Flat washer, 10467
20 Lockwasher, 10430
21 Selector magnet E9
22 Bracket, 52292
23 Setscrew, 10220
24 Bar magnet, 52289
25 Setscrew, 10225
26 Retainer ring, 10969
27 Retainer ring, 10969
28 Armature mounting shaft, 52288
29 Armature, 54092A
30 Machine screw, 10010
31 Lockwasher, 10404
32 Machine screw, 53183
33 Plain hexagonal nut, 10507
34 Armature stop bracket, 52529
35 Armature leaf spring stop screw, 53183
36 Plain hexagonal nut, 10507
37 Setscrew, 10221
38 Setscrew, 10221
39 Selector-magnet bracket, 52528

Figure 259—Continued.

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(11) Install the electrical clamp (15) on the selector-magnet cable (17). Position the electrical clamp on the selector magnet (21) and hold with a lockwasher (16) and stud post (14). Adjust the position of the selector magnet before tightening the stud posts (18 and 14) as described in paragraph 426.

(12) Slide the tubing (12) over the ends of the wires in the tubing (11); solder the wires to the solder lugs on the potentiometer (13). Cover the solder connection with the tubing (12).

(13) Install the potentiometer (13) on the potentiometer mounting bracket (8); secure with a plain hexagonal nut (7) and locking nut (6).

(14) Position the assembled potentiometer (13) and potentiometer mounting bracket (8) on the stud posts; attach with two lockwashers (5) and machine screws (4).

(15) Adjust the selector-magnet attractive force and armature clearance as described in paragraph 321.

(16) Adjust the selector-magnet attractive force and leaf spring alinement as described in paragraph 423.

(17) Install the selector magnet bracket (39) on the frame of the perforator with two flat washers (2), lockwashers (3), and machine screws (1). Plug the selector magnet cable (17) into the socket.

(18) Adjust the alinement of the selector and stop levers with the selector magnet as described in paragraph 423.

(19) Adjust the alinement of the selector and Y-levers with the selector magnet as described in paragraph 424.

(20) Adjust the clearance between the selector levers and the armature blade of the selector magnet as described in paragraph 430.

243. Disassembly and Reassembly of Rangefinder

(fig. 260)

a. Disassembly.

(1) Remove the two machine screws (1), lockwashers (2), and flat washers (3) that hold the rangefinder and comb bracket (15) to the frame of the perforator; remove the rangefinder assembly and shims (4) from the frame.

(2) Remove the knurled nut (5) and flat washer (6) from the rangefinder dial clamp (11).

(3) Remove the two setscrews (7) that hold the rangefinder cam (8) on the shaft of the rangefinder dial (10); remove the rangefinder cam from the shaft.

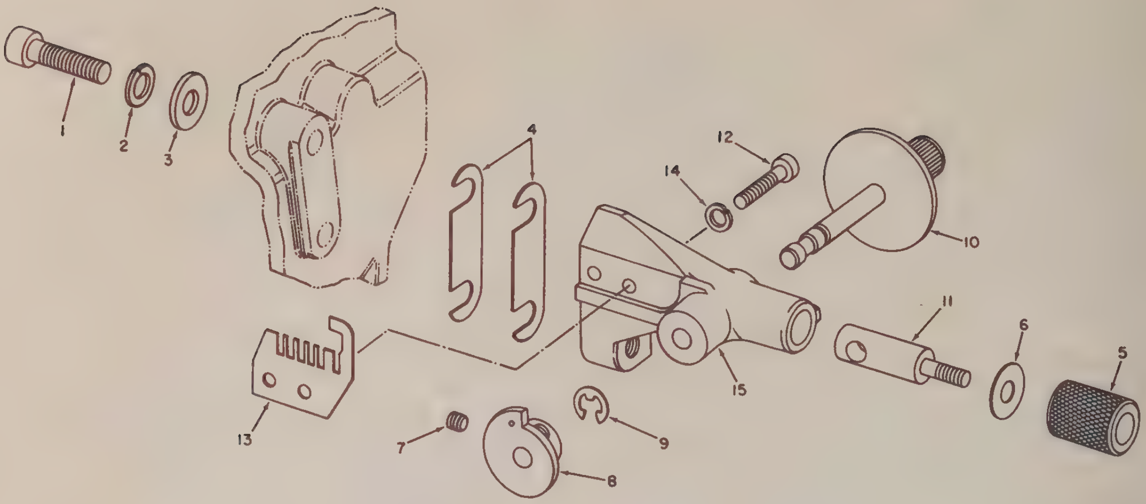
(4) Remove the retainer ring (9) from the rangefinder dial (10); remove the rangefinder dial and rangefinder dial clamp (11) from the rangefinder and comb bracket (15).

(5) Remove the two machine screws (12) and lockwashers (14) that hold the selector lever stop comb (13) to the rangefinder and comb bracket (15); remove the lever stop comb.

b. Reassembly.

(1) Position the selector lever stop comb (13) on the rangefinder and comb bracket (15); attach with two lockwashers (14) and machine screws (12).

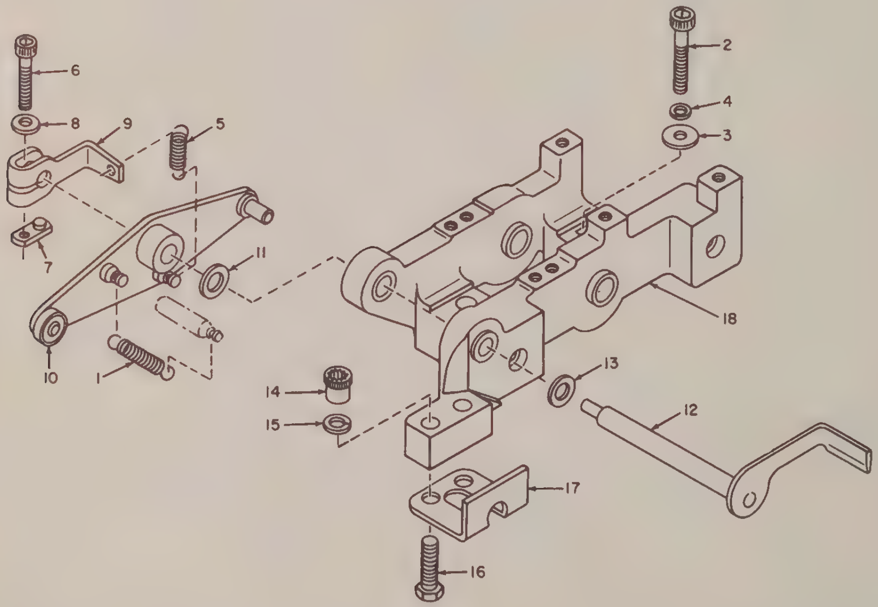
(2) Insert the rangefinder dial clamp (11) in the rangefinder and comb bracket (15). Insert the shaft of the rangefinder dial (10) through the bracket and the range-



TM 2246-355

1 Machine screw, 10018
2 Lockwasher, 10431
3 Flat washer, 10464
4 Shim, .005 in. thk, 52577 Shim, .002 in. thk, 52578
5 Knurled nut, 53819
6 Flat washer, 50887
7 Setscrew, 10201
8 Rangefinder cam, 50317
9 Retainer ring, 10949
10 Rangefinder dial, 52381A
11 Rangefinder dial clamp, 52323
12 Machine screw, 10046
13 Selector lever stop comb, 50511
14 Lockwasher, 10429
15 Rangefinder and comb bracket, 52326

Figure 260. Perforator rangefinder, exploded view.



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1 Code actuated switch cam follower spring, 55678
2 Machine screw, 10042
3 Flat washer, 10464
4 Lockwasher, 10420
5 Register lever spring, 55679
6 Machine screw, 10006
7 Nut plate, 50174
8 Flat washer, 10459
9 Register lever, 55607
10 Code actuated switch cam follower, 55605A
11 Flat washer, 53292
12 Register arm, 55630A
13 Flat washer, 53292
14 Allen nut, 10531
15 Lockwasher, 10043
16 Machine screw, 10085
17 T-lever stop bracket, 55624
18 Bracket mounting, 55668A

Figure 261. Code actuated switch frame assembly, exploded view.

finder dial clamp (11); hold with a retainer ring (9).

(3) Position the rangefinder cam (8) on the shaft of the rangefinder dial (10); hold with two setscrews (7).

(4) Install a flat washer (6) and knurled nut (5) on the threaded portion of the rangefinder dial clamp (11).

(5) Position the shims (4) and the rangefinder and comb bracket (15) on the frame of the perforator; attach with two flat washers (3), lockwashers (2), and machine screws (1).

(6) Adjust the rangefinder as described in paragraphs 297, 317, 318, 319, 320, 321, 423, 424, 425, and 426.

244. Removal and Replacement of Code Actuated Switch

(fig. 261)

a. Removal.

(1) Disconnect the plug that connects the code actuated switch to the perforator base.

(2) Remove the code actuated switch cam follower spring (1) from the code actuated switch cam follower (10) and the spring post on the perforator frame.

(3) Remove the two machine screws (2), flat washers (3), and lockwashers (4) that hold the bracket mounting (18) to the perforator frame; remove the code actuated switch, carefully disengaging the code plates from the T-levers.

b. Replacement.

(1) Position the code actuated switch on the perforator frame so that the code plates engage the tails of the T-levers and the cam roller on the code actuated switch cam follower (10) engages the cam on the code actuated switch function shaft; secure with two machine screws (2), lockwashers (4), and flat washers (3).

(2) Install the code actuated switch cam follower spring (1) on the code actuated switch cam follower (10) and the spring post on the perforator frame.

(3) Connect the plug from the code actuated switch to the perforator base.

(4) Adjust the code actuated switch as described in paragraphs 429 through 434.

245. Disassembly and Reassembly of Code Actuated Switch Printed Commutator

(fig. 262)

a. Disassembly.

(1) Remove the code actuated switch from the perforator as described in paragraph 244*a*.

(2) Remove the machine screw (1), flat washer (3), and lockwasher (4) that hold the terminals cover (2) to the printed commutator; remove the terminal cover.

(3) Remove the two machine screws (5), flat washers (6), and lockwashers (7) that hold the printed commutator assembly to the code actuated switch frame; remove the printed commutator assembly.

(4) Remove the two self-locking hexagonal nuts (8) and machine screws (9) that hold the contact wiper guide (10) and cover plate (11) to the assembled support block (18) and printed commutator (20), remove the support guide and cover plate.

(5) Remove the five contact wiper springs (12) that hold the five contact wipers (13) to the spring holder (14); remove the contact wipers and spring holder.

(6) Remove the two self-locking hexagonal nuts (15) that hold the female pilot screw (16) and the male pilot screw (17) to the printed commutator (20); remove the two pilot screws. Remove the support block from the printed commutator.

(7) Remove the four machine screws (19) from the contacts on the printed commutator.

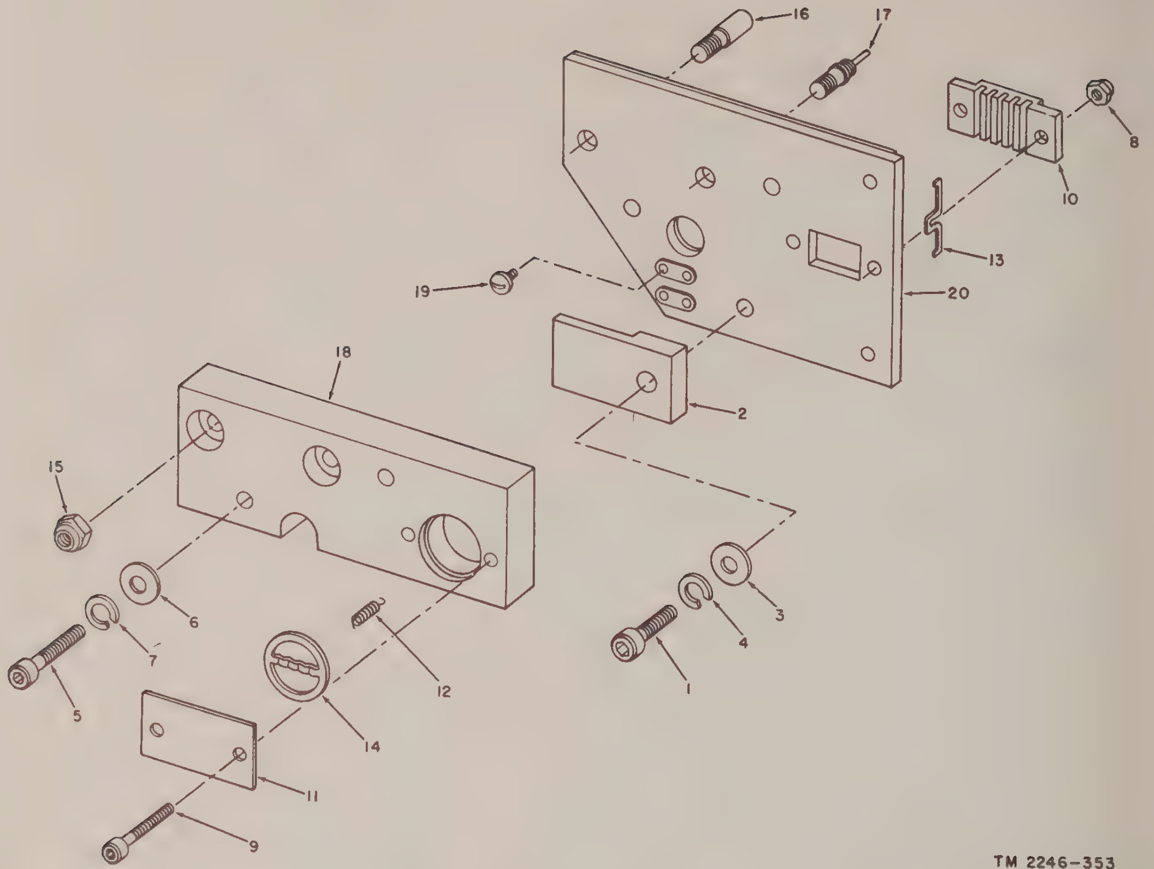
b. Reassembly.

(1) Install the four machine screws (19) on the contacts of the printed commutator (20).

(2) Position the support block (18) on the printed commutator. Position the male pilot screw (17) and female pilot screw (16) on the assembled printed commutator and support block; secure with two self-locking hexagonal nuts (15).

(3) Position the spring holder (14) on the support block. Install the five contact wiper springs (12) on the spring holder and install five contact wipers (13) on the opposite ends of the springs.

(4) Position the contact wiper (10) and cover plate (11) on the assembled support



1	Machine screw, 10046
2	Terminal cover, 56138
3	Flat washer, 10450
4	Lockwasher, 10429
5	Machine screw, 10041
6	Flat washer, 10405
7	Lockwasher, 10429
8	Self-locking hexagonal nut, 10051
9	Machine screw, 10062
10	Contact wiper guide, 55636
11	Cover plate, 55692
12	Contact wiper spring, 55641
13	Contact wiper, 55321
14	Spring holder, 55637
15	Self-locking hexagonal nut, 10503
16	Female pilot screw, 20856
17	Male pilot screw, 20855
18	Support lock, 55634
19	Machine screw, 10362
20	Printed commutator, 55638A

Figure 262. Code actuated switch printed commutator, exploded view.

block and printed commutator, being careful to align the five contact wipers (13) in the five slots in the contact wiper guide. Secure with two machine screws (9) and self locking hexagonal nuts (8).

(5) Position the printed commutator assembly on the code actuated switch frame; secure with two machine screws (5), flat washers (6), and lockwashers (7).

(6) Position the terminal cover (2) on the printed commutator; secure with a machine screw (1), flat washer (3), and lockwasher (4).

(7) Install the code actuated switch on the perforator as described in paragraph 244*b*.

246. Disassembly and Reassembly of Code Actuated Switch Code Plates

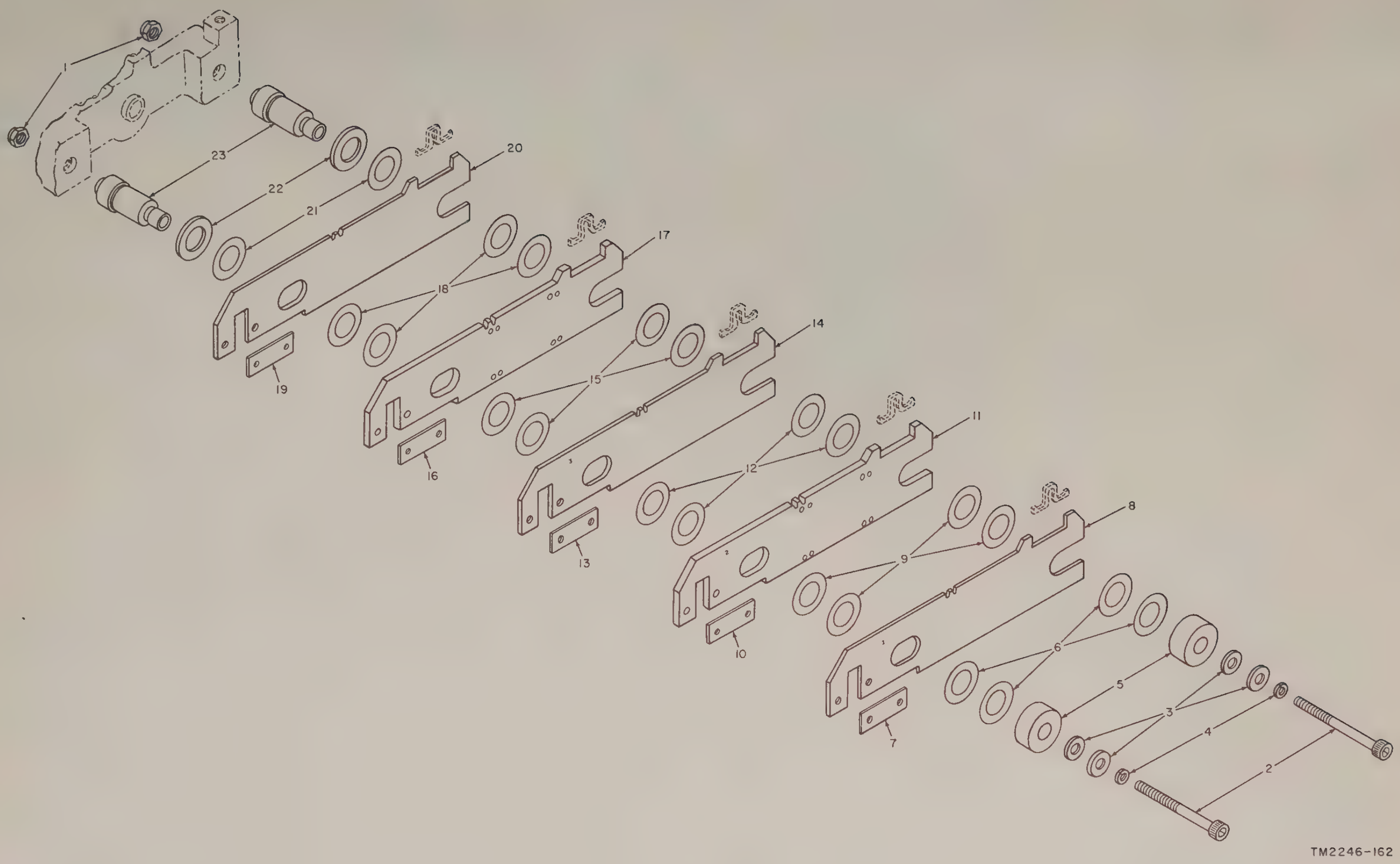
(fig. 263)

a. Disassembly.

(1) Remove the code actuated switch from the perforator as described in paragraph 244*a*.

(2) Remove the printed commutator from the code actuated switch as described in paragraph 245*a*.

(3) Remove the two self-locking hexagonal



1	Self-locking hexagonal nut, 10501
2	Machine screw, 10060
3	Flat washer, 10463
4	Lockwasher, 10430
5	Collar, 55632
6	Spacing collar, 55651
7	T-lever guide plate, 55657
8	Code plate, 55656
9	Spacing collar, 55651
10	T-lever guide plate, 55657
11	Code plate, 55671
12	Spacing collar, 55651
13	T-lever guide plate, 55657
14	Code plate, 55656
15	Spacing collar, 55651
16	T-lever guide plate, 55657
17	Code plate, 55671
18	Spacing collar, 55651
19	T-lever guide plate, 55657
20	Code plate, 55656
21	Spacing collar, 55651
22	Code plate spacing collar, 55652
23	Sleeve bearing, 55694

Figure 263. Code actuated switch code plates, exploded view.

nuts (1), socket head machine screws (2), four flat washers (3), and two lockwashers (4) that attach the collars (5) and the two sleeve bearings (23) to the bracket mounting.

(4) Remove the collars (5) and four spacing collars (6) from the two sleeve bearings (23). Remove the T-lever guide plate (7) from the code plate (8). Remove the code plate (8) from the two sleeve bearings.

(5) Similarly remove the remaining spacing collars (9, 12, 15, and 18); the T-lever guide plates (10, 13, 16, and 19); and the code plates (11, 14, 17, and 20).

(6) Remove the two spacing collars (21) and the two code plate spacing collars (22) from the two sleeve bearings (23); remove the two sleeve bearings from the bracket mounting.

b. Reassembly.

(1) Position the two sleeve bearings (23) on the bracket mounting; place the two code plate spacing collars (22) and the two spacing collars (21) on the sleeve bearings.

(2) Position the code plate (20) on the two sleeve bearings; hold the code plate (20) against the spacing collars (21) and the bracket mounting. Position the T-lever guide plate (19) on the code plate. Install the four spacing collars (18) on the sleeve bearings (23).

(3) Similarly reassemble the remaining code plates (17, 14, 11, and 8); the spacing collars (15, 12, 9, and 6); and the T-lever guide plates (16, 13, 10, and 7).

(4) Position the collars (5) on the sleeve bearings; attach with two lockwashers (4), four flat washers (3), two socket head machine screws (2), and two self-locking hexagonal nuts (1).

(5) Adjust the code actuated switch as described in paragraphs 429 through 434.

(6) Install the printed commutator on the code actuated switch as described in paragraph 245*b*.

(7) Install the code actuated switch on the perforator as described in paragraph 244*b*.

247. Disassembly and Reassembly of Code Actuated Switch Frame Assembly

(fig. 261)

a. Disassembly.

(1) Remove the code actuated switch from the perforator as described in paragraph 244*a*.

(2) Remove the printed commutator from the code actuated switch as described in paragraph 245*a*.

(3) Remove the code plates as described in paragraph 246*a*.

(4) Remove the register lever spring (5) from the code actuated switch cam follower (10) and from the register lever (9).

(5) Remove the machine screw (6), nut plate (7), and flat washer (8) holding the register lever (9) to the register arm (12); remove the register lever.

(6) Remove the code actuated switch cam follower (10) and flat washer (11) from the register arm (12).

(7) Remove the register arm (12) and flat washer (13) from the bracket mounting (18).

(8) Remove the two Allen nuts (14), lockwashers (15), and machine screws (16) that attach the T-lever stop bracket (17) to the bracket mounting (18); remove the T-lever stop bracket.

b. Reassembly.

(1) Position the T-lever stop bracket (17) on the bracket mounting (18); attach with two machine screws (16), lockwashers (15), and Allen nuts (14).

(2) Install the flat washer (13) on the register arm (12); insert the register arm (12) in the bracket mounting (18).

(3) Install the flat washer (11) and code actuated switch cam follower (10) on the register arm.

(4) Install the register lever (9) on the register arm (12); hold with a nut plate (7), flat washer (8), and machine screw (6).

(5) Hook the register lever spring (5) on the code actuated switch cam follower (10) and the register lever (9).

(6) Install the code plates as described in paragraph 246*b*.

(7) Install the printed commutator on the

code actuated switch as described in paragraph 245*b*.

(8) Install the code actuated switch on the perforator as described in paragraph 244*b*.

(9) Adjust the code actuated switch as instructed in paragraphs 429 through 434.

248. Removal and Replacement of Receiving Multisolenoid

(fig. 264)

a. Removal.

(1) Disconnect the plug that connects the receiving multisolenoid to the perforator base.

(2) Remove the manual tape feed out link from the collar (7), on the Y-lever pivot post stud (11).

(3) Remove the machine screw (1), lockwasher (2), two machine screws (3), flat washers (4), and lockwashers (5) that hold the mounting bracket (34) to the perforator frame; remove the receiving multisolenoid.

b. Replacement.

(1) Position the receiving multisolenoid on the perforator frame; secure with two machine screws (3), lockwashers (5), flat washers (4), a machine screw (1) and lockwasher (2).

(2) Install the manual tape feed out link on the collar (7) on the Y-lever pivot post stud.

(3) Connect the plug that connects the receiving multisolenoid to the perforator base.

(4) Adjust the receiving multisolenoid as described in paragraphs 448 through 450.

249. Disassembly and Reassembly of Receiving Multisolenoid Plungers and Y-Levers

(fig. 264)

a. Disassembly.

(1) Remove the receiving multisolenoid from the perforator as described in paragraph 248*a*.

(2) Remove the two setscrews (6) that hold the collar (7) on the Y-lever pivot post stud (11); remove the collar.

(3) Remove the setscrew (8) that holds the straight pin (9) in the mounting bracket (34); remove the straight pin.

(4) Remove the setscrew (10) that holds the Y-lever pivot post stud in the mounting bracket; remove the selector Y-lever pivot post stud (11) from the back of the mounting bracket (34).

(5) Remove the flat washer (12). Slide the end of the plunger connecting wire off the pin on the multisolenoid Y-lever (13). remove the multisolenoid Y-lever (13).

(6) Loosen the hexagonal nut (15); remove the multisolenoid plunger (14) from the receiving multisolenoid. Remove the hexagonal nut from the plunger.

(7) Similarly remove the remaining flat washers (16, 20, 24, 28, and 32); multisolenoid Y-levers (17, 21, 25, and 29); multisolenoid plungers (18, 22, 26, and 30); and hexagonal nuts (19, 23, 27, and 31).

(8) Remove the flat washer (32) and collar (33).

(9) Remove the receiving multisolenoid from the mounting bracket (34) as described in paragraph 248*a*(3).

b. Reassembly.

(1) Install the receiving multisolenoid on the mounting bracket as described in paragraph 248*b*(1).

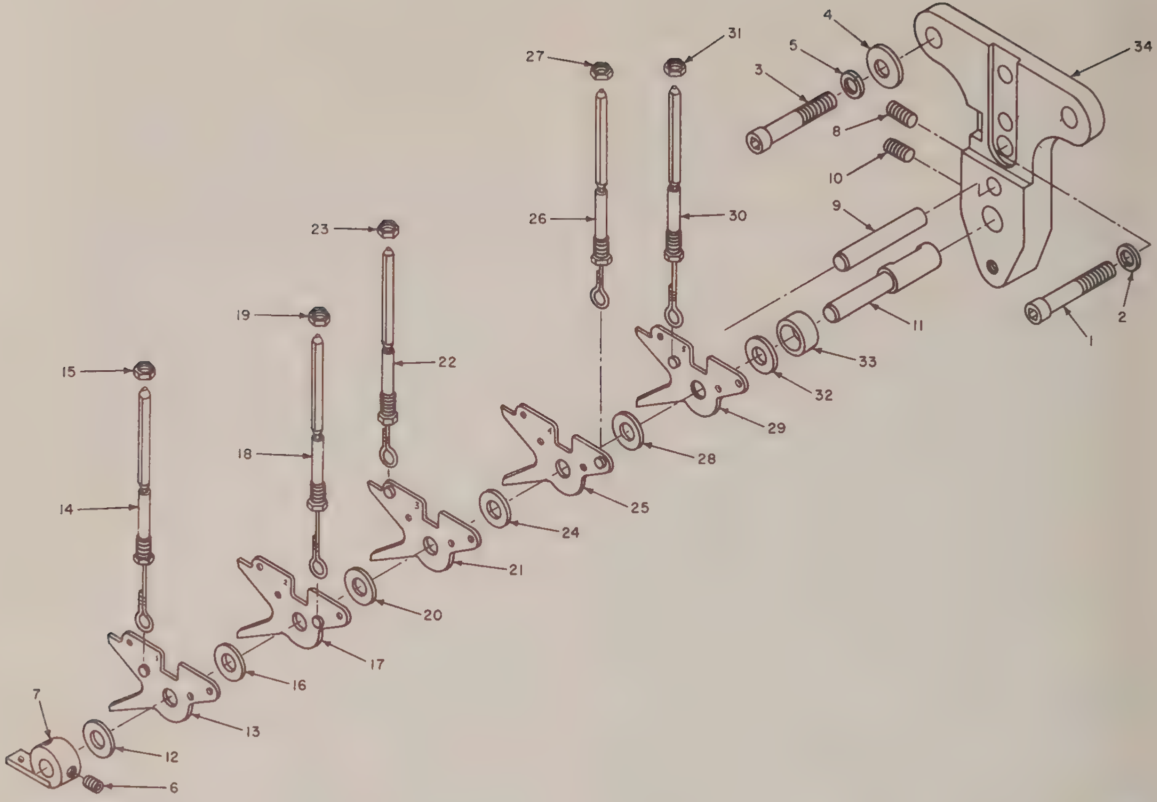
(2) Position the collar (33) and flat washer (32) on the mounting bracket (34). Slide the Y-lever pivot post stud (11) in the back of the bracket (34) far enough to hold the assembled parts.

(3) Install a hexagonal nut (31) on the multisolenoid plunger (30). Install the plunger in the multisolenoid. Position the multisolenoid Y-lever (29) on the Y-lever pivot post stud (11); hook the end of the plunger connecting wire to the pin on the multisolenoid Y-lever. Install a flat washer (28).

Note. The multisolenoid Y-levers are marked 1, 2, 3, 4, and 5. They are installed in numerical sequence with No. 5 being closest to the mounting bracket. The numbered sides face outward.

(4) Similarly install the remaining hexagonal nuts (27, 23, 19, and 15); multisolenoid plungers (26, 22, 18, and 14); multisolenoid Y-levers (25, 21, 17, and 13); and flat washers (24, 20, 16, and 12).

(5) Install the collar (7) on the Y-lever pivot post stud (11); hold with two setscrews (6).



No.	Part
1	Machine screw, 10018
2	Lockwasher, 10420
3	Machine screw, 10018
4	Flat washer, 10464
5	Lockwasher, 10420
6	Setscrew, 10209
7	Collar, 50149
8	Setscrew, 10210
9	Straight pin, 56078
10	Setscrew, 10210
11	Y-lever pivot post stud, 53269
12	Flat washer, 50147
13	Multisolenoid Y-lever, 56080
14	Multisolenoid plunger, 54924A
15	Hexagon nut, 56108
16	Flat washer, 50147
17	Multisolenoid Y-lever, 56081A
18	Multisolenoid plunger, 54924A
19	Hexagonal nut, 56108
20	Flat washer, 50147
21	Multisolenoid Y-lever, 56082A
22	Multisolenoid plunger, 54916A
23	Hexagonal nut, 56108
24	Flat washer, 50147
25	Multisolenoid Y-lever, 56083A
26	Multisolenoid plunger, 54916A
27	Hexagonal nut, 56108
28	Flat washer, 50147
29	Multisolenoid Y-lever, 56084A
30	Multisolenoid plunger, 54924A
31	Hexagonal nut, 56108
32	Flat washer, 50147
33	Collar, 51414
34	Mounting bracket, 56133A

Figure 264. Receiving multisolenoid plungers and Y-levers, exploded view.

(6) Adjust the receiving multisolenoid as described in paragraphs 448 through 450.

250. Disassembly and Reassembly of Receiving Multisolenoid

(fig. 265)

a. Disassembly.

(1) Remove the receiving multisolenoid as described in paragraph 248*a*.

(2) Remove the multisolenoid plungers and Y-levers as described in paragraph 249*a*.

(3) Remove the two machine screws (1), lockwashers (2), and plate clamp (3) that hold the multisolenoid support block (31) to the multisolenoid mounting bracket; remove the receiving multisolenoid.

(4) Remove the wires from the plug connector (4); tag the wires to facilitate reconnecting.

(5) Remove the machine screw (5) and lockwasher (6) that hold the cable ferrule (11) to the support block (21).

(6) Remove the four machine screws (7) and lockwashers (8) that hold the upper support block (21) to the lower support block (31). Remove the clamp (9) from the cable sheath (10).

(7) Remove the cable sheath (10) and the cable ferrule (11) from the wires.

(8) Pry the upper and lower support blocks (21 and 31) apart far enough to insert a tool to remove the spacing collar (12) that holds the wires in place in the upper support block. Separate the support blocks and remove the spacing collar (12).

(9) Remove the five solenoid coils (13, 15, 16, 17, and 18) and the five spring washers (14).

(10) Loosen the five hexagonal nuts (20) and remove the plunger stops (19); remove the nuts from the pole pieces.

(11) Remove the five mounting guides (22) from the lower support block (31).

(12) Remove the mounting plate (23) from the lower support block (31).

(13) Remove the spacing collar (24) from the lower support block (31).

(14) Remove the five solenoid coils (25, 27, 28, 29, and 30) and the five spring washers (26) from the lower support block (31).

b. Reassembly.

(1) Insert the five spring washers (26) and the five solenoid coils (30, 29, 28, 27, and 25) in the lower support block (31)

(2) Place the coil wires in the grooves to avoid kinks and loose wires and thread the wires through the spacing collar (24). Hold the wires in position in the lower support block (31) by installing the spacing collar in the center hole of the lower support block.

(3) Thread the wires through the hole in the mounting plate (23); position the mounting plate on the lower support block (31).

(4) Position the five mounting guides (22) in the mounting plate (23) and lower support block (31).

(5) Screw the five hexagonal nuts (20) on the five plunger stops (19); install the plunger stops in the upper support block (21).

(6) Insert the five spring washers (14) and five solenoid coils (18, 17, 16, 15, and 13) in the upper support block (21).

(7) Thread the wires from the upper coils in the grooves of the upper support block (21); hold by installing the spacing collar (12) in the center hole of the support block. Thread the wires from all 10 coils through the large unthreaded hole of the upper support block. Bring the upper and the lower support blocks together.

(8) Thread the wires through the cable ferrule (11) and the cable sheath (10). Insert the end of the cable sheath in the upper support block; slip the cable ferrule over the end of the cable sheath to hold it in the support block.

(9) Hold the cable ferrule (11) in place with a machine screw (5) and lockwasher (6).

(10) Place the clamp (9) on the cable; position the clamp on the upper support block (21). Attach the upper support block to the lower support block (31) with four lockwashers (8) and machine screws (7).

(11) Connect the wires to the proper terminals of the plug connector (4).

(12) Position the receiving multisolenoid on the multisolenoid bracket mounting; secure with two machine screws (1), lockwashers (2), and a plate clamp (3).

(13) Install the multisolenoid plungers and Y-levers as described in paragraph 249*b*.

(14) Install the receiving multisolenoid on the perforator as described in paragraph 248*b*.

(15) Adjust the receiving multisolenoid as described in paragraphs 448 through 450.

251. Removal and Replacement of Manual Tape Feed-out Mechanism

(fig. 266)

a. Removal.

(1) Remove the machine screw (1), and lockwasher (2) that hold the rear support plate (38) to the perforator frame.

(2) Remove the two machine screws (3) and lockwashers (4) that hold the front support plate (28) to the spacing studs (5 and 32).

(3) Remove the two setscrews that hold the collar to the Y-lever pivot post stud (11, fig. 264); remove the collar and link (23) from the post stud.

(4) Unsolder the electrical leads from the manual tape feed-out switch (35).

(5) Remove the spacing stud (5) that holds the rear support plate (38) to the perforator frame; remove the manual tape feed-out mechanism from the perforator.

b. Replacement.

(1) Position the rear support plate (38) on the

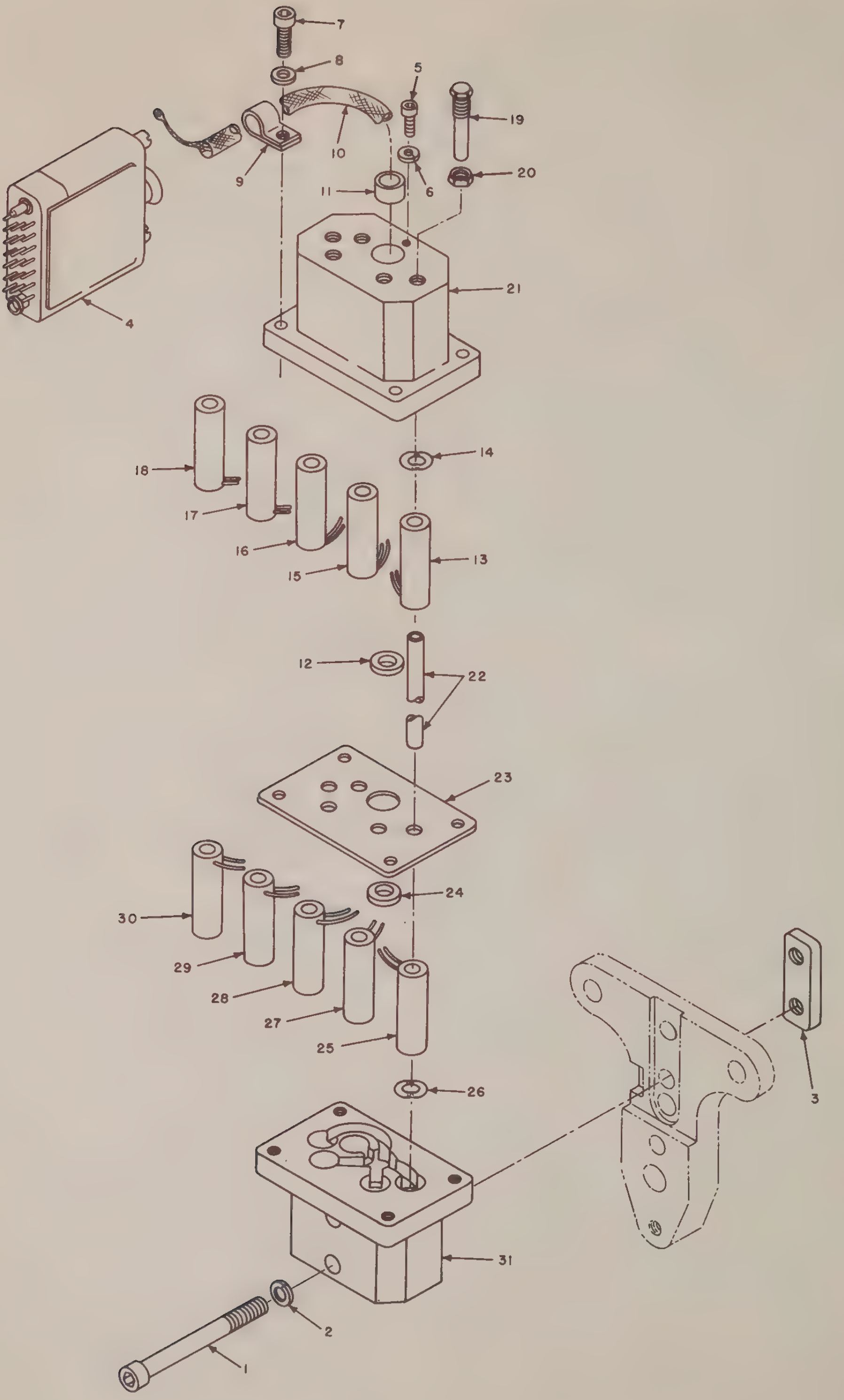


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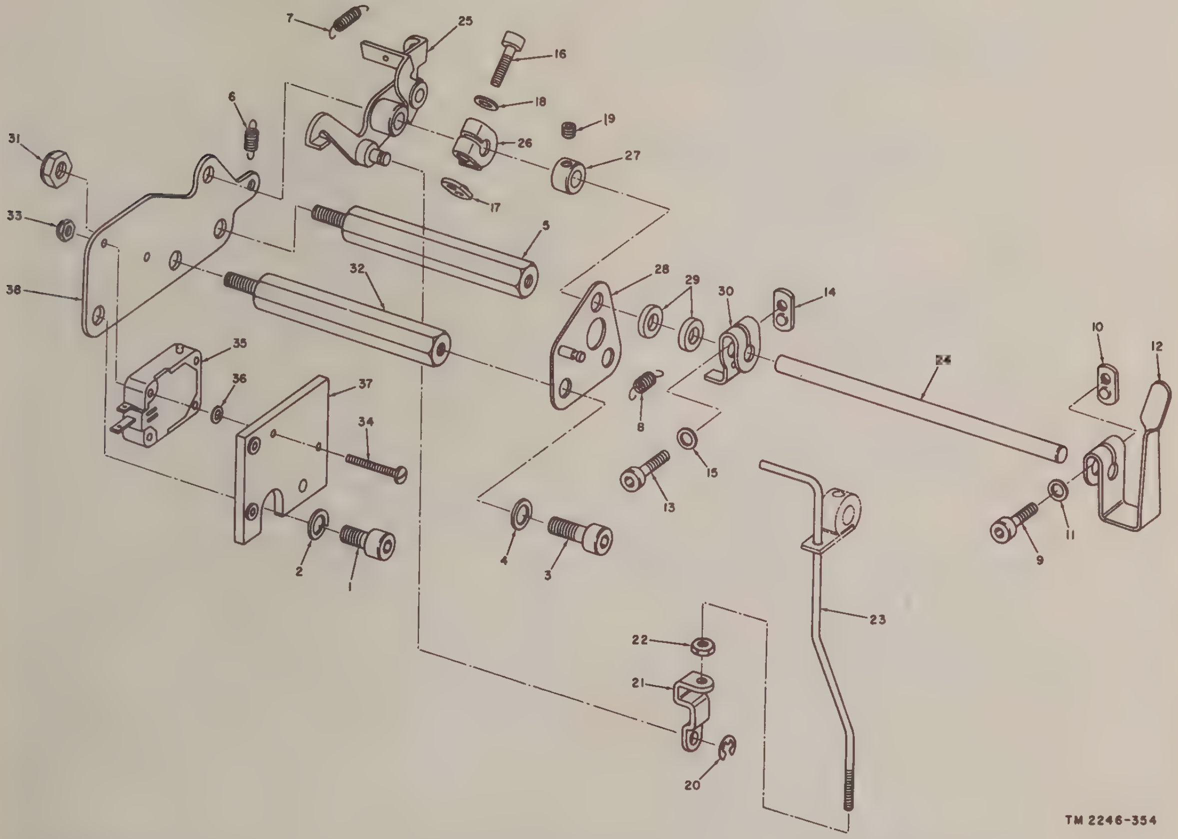
Figure 265. Receiving multisolenoid, exploded view.

1 Machine screw, 10056
2 Lockwasher, 10431
3 Plate clamp, 56077
4 Plug connector, 20427
5 Machine screw, 10055
6 Lockwasher, 10403
7 Machine screw, 11500
8 Lockwasher, 10403
9 Clamp, 20519
10 Cable sheath, 54910A
11 Cable ferrule, 54922
12 Spacing collar, 54908
13 Solenoid coil, 56118A
14 Spring washer, 54901
15 Solenoid coil, 56116A
16 Solenoid coil, 56114A
17 Solenoid coil, 56112A
18 Solenoid coil, 56110A
19 Plunger stop, 54923
20 Hexagonal nut, 56108
21 Support block, 54902
22 Mounting guide, 54907
23 Mounting plate, 54906
24 Spacing collar, 54908
25 Solenoid coil, 56113A
26 Spring washer, 54901
27 Solenoid coil, 56111A
28 Solenoid coil, 56119A
29 Solenoid coil, 56117A
30 Solenoid coil, 56115A
31 Support block, 54904

Figure 265—Continued.



1 Machine screw, 10015
2 Lockwasher, 10431
3 Machine screw, 10024
4 Lockwasher, 10431
5 Spacing stud, 56577
6 Spring, 56591
7 Disabling latch spring, 56586
8 Manual tape feed-out lever spring, 56594
9 Clamping screw, 10006
10 Nut plate, 50174
11 Flat washer, 10495
12 Manual tape feed-out lever, 52646
13 Clamping screw, 10006
14 Nut plate, 50174
15 Flat washer, 10459
16 Clamping screw, 10006
17 Nut plate, 50174
18 Flat washer, 10459
19 Setscrew, 10201
20 Retainer ring, 10960
21 Connector link 51783
22 Plain hexagonal nut, 10520
23 Manual tape feed-out link, 56583
24 Tape feed-out shaft, 56576
25 Switch operating lever, 56590
26 Clamp, 56593
27 Shaft collar, 50391
28 Front support plate, 56582A
29 Flat washer, 50827
30 Limit stop lever, 56593
31 Self-locking hexagonal nut, 10525
32 Spacing stud, 56577
33 Selflocking hexagonal nut, 10535
34 Machine screw, 10201
35 Manual tape feed-out switch S34
36 Flat washer, 55081
37 Switch cover, 56585A
38 Rear support plate, 56581

Figure 266. Manual tape feed-out mechanism, exploded view.

perforator frame; secure with a spacing stud (5).

(2) Solder the electrical leads to the manual tape feed-out switch (35)

(3) Position the manual tape feed-out link (23) and collar on the Y-lever pivot post stud (11, fig. 264); secure the collar with two setscrews.

(4) Position the front support plate (28) on the spacing studs (32 and 5); secure with two machine screws (3) and lockwashers (4).

(5) Install the machine screw (1) and lockwasher (2) that hold the left side of the rear support plate (38) to the perforator frame.

252. Disassembly and Reassembly of Manual Tape Feed-out Mechanism

(fig. 266)

a. Disassembly.

(1) Remove the manual tape feed-out mechanism as described in paragraph 251*a*.

(2) Remove the spring (6) from the switch operating lever (25) and from the rear support plate (38).

(3) Remove the disabling latch spring (7) from the switch operating lever and from the kickout pawl on the switch operating lever.

(4) Remove the manual tape feed-out lever spring (8) from the spring post on the front support plate (28) and from the limit stoplever (30).

(5) Remove the clamping screw (9), nut plate (10), and flat washer (11) that hold the manual tape feed-out lever (12) to the tape feed-out shaft (24); remove the manual tape feed-out lever.

(6) Remove the clamping screw (13), nut plate (14), and flat washer (15) that hold the limit stop lever (30) to the tape feed-out shaft (24).

(7) Remove the clamping screw (16), nut plate (17), and flat washer (18) that hold the clamp (26) to the tape feed-out shaft (24).

(8) Remove the setscrew (19) that holds the shaft collar (27) to the tape feed-out shaft (24).

(9) Remove the retainer ring (20) that holds the connector link (21) to the switch operating lever (25); remove the assembled manual tape feed-out link (23) and connector link. Remove the connector link and plain bexagonal nut (22) from the manual tape feed-out link.

(10) Remove the tape feed-out shaft (24), catching the switch operating lever (25), clamp (26), shaft collar (27), front support plate (28), two flat washers (29), and limit stop lever (30) as they fall from the shaft.

(11) Remove the self-locking hexagonal nut (31) that holds the spacing stud (32) to the rear support plate (38); remove the spacing stud.

(12) Remove the two self-locking hexagonal nuts (33) and machine screws (34) that hold the switch cover (37) to the rear support plate (38); remove the manual tape feed-out switch (35), two flat washers (36), and the switch cover.

b. Reassembly.

(1) Position the manual tape feed-out switch (35), two flat washers (36), and the switch cover (37) on the rear support plate (38); secure with two machine screws (34) and self-locking hexagonal nuts (33).

(2) Position the spacing stud (32) on the rear support plate (38); secure with a self-locking hexagonal nut (31).

(3) Position the limit stop lever (30), two flat washers (29), front support plate (28), shaft collar (27, clamp 26), and switch operating lever (25) on the tape feed-out shaft (24).

(4) Install the plain hexagonal nut (22) and connector link (21) on the manual tape feed-out link (23). Position the manual tape feed-out link on the switch operating lever (25); secure with a retainer ring (20).

(5) Install the setscrew (19) that holds the shaft collar (27) to the tape feed-out shaft (24).

(6) Install the clamping screw (16), flat washer (18), and nut plate (17) that hold the clamp (26) to the switch operating lever (25).

(7) Install the clamping screw (13), flat washer (15), and nut plate (14) that hold the limit stop lever (30) to the feed-out shaft (24).

(8) Position the manual tape feed-out lever

(12) on the tape feed-out shaft (24); secure with a clamping screw (9), flat washer (11), and nut plate (10).

(9) Install the manual tape feed-out lever spring (8) on the spring post on the front support plate (28) and on the limit stop lever (30).

(10) Install the disabling latch spring (7) on the switch operating lever (25) and on the kickout pawl on the switch operating lever.

(11) Install the spring (6) on the switch operating lever (25) and on the rear support plate (38).

(12) Adjust the manual tape feed-out mechanism as described in paragraphs 494 through 496.

(13) Install the manual tape feed-out mechanism as described in paragraph 251*b*.

253. Removal and Replacement of Ribbon Supply Group

(fig. 267)

a. Removal.

(1) Remove the ribbon spools (1) and ribbon from the ribbon spool shaft (27).

(2) Remove the machine screw (2) and lockwasher (3) that hold the ribbon feed brace (46) to the perforator frame.

(3) Remove the two machine screws (4) and lockwashers (5) that hold the ribbon feed mounting bracket (50) to the front support frame. Disengage the ribbon feed cam follower (8) from the cam on the receiving multisolenoid function shaft and remove the ribbon supply group from the perforator.

b. Replacement.

(1) Position the ribbon supply group on the perforator, being careful to engage the ribbon feed cam follower (8) with the cam on the receiving multisolenoid function shaft. Secure the ribbon feed mounting bracket (50) to the front support frame with two machine screws (4) and lockwashers (5).

(2) Position the ribbon feed brace (46 on the perforator frame; secure with a machine screw (2) and lockwasher (3).

(3) Install the ribbon spools (1) and inking ribbon on the perforator as described in paragraph 30*f*.

254. Disassembly and Reassembly of Ribbon Supply Group

(fig. 267)

a. Disassembly.

(1) Remove the ribbon supply group from the perforator as described in paragraph 253*a*.

(2) Remove the ribbon feed cam follower spring (6) from the ribbon feed cam follower (8) and from the spring post on the ribbon feed mounting bracket (50).

(3) Remove the retainer ring (7) that holds the ribbon feed cam follower (8) to the eccentric stud (11); remove the ribbon feed cam follower and flat washer (9).

(4) Remove the setscrew (10) that holds the eccentric stud (11) to the ribbon feed mounting bracket (50); remove the driving lever stud.

(5) Remove the six retainer rings (12) that hold the ribbon retainer levers (15) to the ribbon retainer shaft (14). Remove the two ribbon retainer lever springs (13) from the ribbon retainer levers and from the holding clip brackets (20). Remove the ribbon retainer shaft (14), catching the ribbon retainer levers as they fall from the shaft.

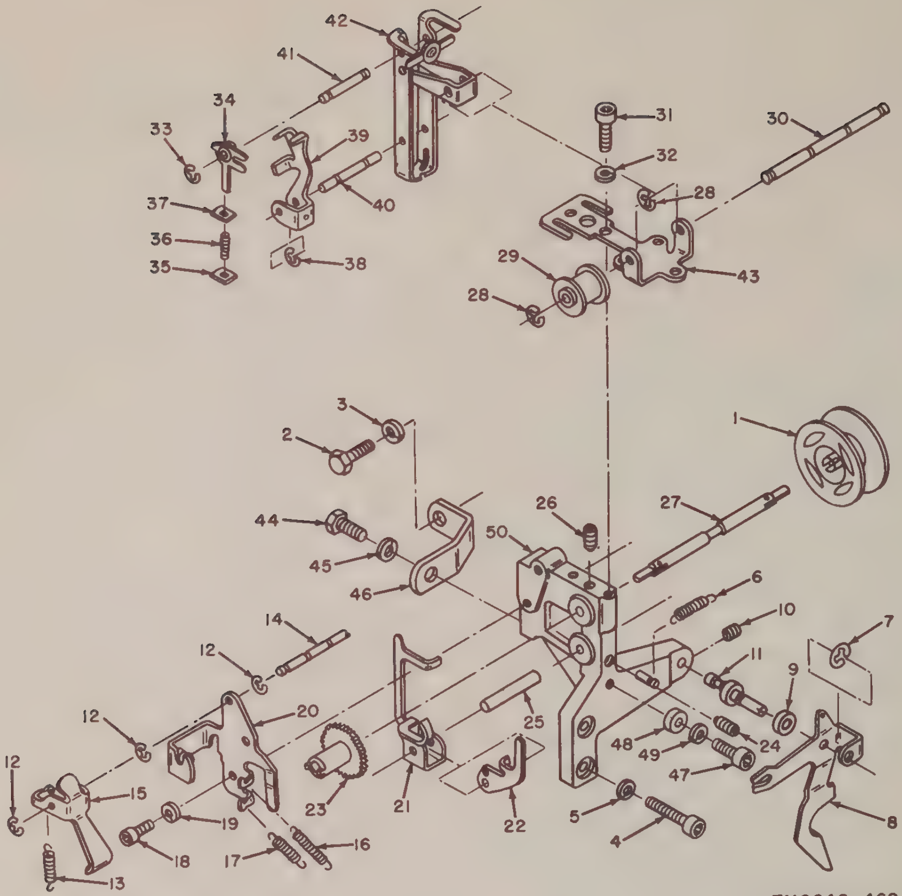
(6) Remove the two ribbon feed detent lever springs (16) from the holding clip brackets (20) and from the ribbon feed levers (39). Remove the two ribbon retainer lever springs (17) from the holding clip brackets and from the ratchet feed detents (22).

(7) Remove the four machine screws (18) and lockwashers (19) that hold the holding clip brackets (20) to the ribbon feed mounting bracket (50); remove the holding clip brackets.

(8) Remove the sensing levers (21) and the ratchet feed detents (22) from the sensing lever shaft (25). Remove the ribbon feeding detent wheel (23) from the ribbon spool shaft (27).

(9) Remove the setscrew (25) that holds the sensing lever shaft (25) in the ribbon feed mounting bracket (50); remove the sensing lever shaft.

(10) Remove the setscrew (26) that holds the ribbon spool shaft (27) in the ribbon feed



1	Ribbon spool
2	Machine screw, 10397
3	Lockwasher, 10431
4	Machine screw, 10028
5	Lockwasher, 10430
6	Ribbon feed cam follower spring, 52602
7	Retainer ring, 10949
8	Ribbon feed cam follower, 56234
9	Flat washer, 50827
10	Setscrew, 10210
11	Eccentric stud, 52585
12	Retainer ring, 10969
13	Ribbon retainer lever spring, 52603
14	Ribbon retainer shaft, 53178
15	Ribbon retainer lever, 52708
16	Ribbon feed detent lever spring, 52604
17	Ribbon retainer lever spring, 52603
18	Machine screw, 10001
19	Lockwasher, 10429
20	Left-hand holding clip bracket, 56226A Right-hand holding clip bracket, 56228A
21	Left-hand sensing lever, 52597 Right-hand sensing lever, 52596
22	Left-hand ratchet feed detent, 52610A Right-hand ratchet feed detent, 52611A
23	Left-hand ribbon feeding detent wheel, 52591A Right-hand ribbon feeding detent wheel, 52590A
24	Setscrew, 10210
25	Sensing lever shaft, 52595
26	Setscrew, 10210
27	Ribbon spool shaft, 56231A
28	Retainer ring, 10949
29	Ribbon roller, 52608
30	Ribbon roller shaft, 52601
31	Machine screw, 1008
32	Lockwasher, 10430
33	Retainer ring, 10969
34	Left-hand ribbon reversing arm, 52705 Right-hand ribbon reversing arm, 52704
35	Spring washer, 53427
36	Contact plunger spring, 51593
37	Spring washer, 53427
38	Retainer ring, 10969
39	Left-hand ribbon feed lever, 52605 Right-hand ribbon feed lever, 52607
40	Ribbon feed pawl shaft, 52609
41	Reversing arm shaft, 52703
42	Driving link lever, 52622
43	Roller bracket, 52598
44	Machine screw, 10397
45	Lockwasher, 10431
46	Ribbon feed brace, 52581
47	Machine screw, 10008
48	Spacing collar, 53334
49	Lockwasher, 10430
50	Ribbon feed mounting bracket, 52512A

Figure 267. Ribbon supply group, exploded view.

mounting bracket (50); remove the ribbon spool shaft.

(11) Remove the four retainer rings (28) that hold the ribbon rollers (29) to the ribbon roller shaft (30) and hold the ribbon roller shaft to the roller bracket (43); remove the ribbon rollers from the ribbon roller shaft and remove the ribbon roller shaft from the roller bracket.

(12) Remove the two machine screws (31) and lockwashers (32) that hold the roller bracket (43) to the ribbon feed mounting bracket (50); remove the upper ribbon feed and reversing mechanism from the ribbon feed mounting bracket.

(13) Remove the two retainer rings (33) that hold the ribbon reversing arms (34) to the reversing arm shaft (41); remove the ribbon reversing arms. Remove the two spring washers (35), contact plunger springs (36), and spring washers (37) from the ribbon reversing arms.

(14) Remove the two retainer rings (38) that hold the ribbon feed levers (39) to the ribbon feed pawl shaft (40); remove the ribbon feed levers and remove the ribbon feed pawl shaft. Remove the reversing arm shaft (41) from the driving link lever (42). Remove the driving link lever from the roller bracket (43).

(15) Remove the machine screw (44) and lockwasher (45) that hold the ribbon feed brace (46) to the ribbon feed mounting bracket (50); remove the ribbon feed brace.

(16) Remove the machine screw (47) and lockwasher (49) that hold the spacing collar (48) to the ribbon feed mounting bracket (50); remove the spacing collar.

b. *Reassembly.*

(1) Position the spacing collar (48) on the ribbon feed mounting bracket (50); secure with a machine screw (47) and lockwasher (49).

(2) Position the ribbon feed brace (46) on the ribbon feed mounting bracket (50); secure with a machine screw (44) and lockwasher (45).

(3) Position the driving link lever (42) on the roller bracket (43). Install the reversing arm shaft (41) and the ribbon feed pawl shaft (40) on the driving link lever. Position the two ribbon feed levers (39) on the ribbon feed pawl shaft; secure with two retainer rings (38).

(4) Position the two spring washers (37), contact plunger springs (36), and spring washers (35) on the ribbon reversing arms (34). Position the ribbon reversing arms on the reversing arm shaft (41) on the driving link lever (42), secure with two retainer rings (33).

(5) Position the upper ribbon feed and reversing mechanism on the ribbon feed mounting bracket (50); secure with two machine screws (31) and lockwashers (32).

(6) Position the ribbon roller shaft (30) on the roller bracket (43). Position the two ribbon rollers (29) on the ribbon roller shaft; secure with four retainer rings (28).

(7) Position the ribbon spool shaft (27) in the ribbon feed mounting bracket (50); secure with a setscrew (26).

(8) Position the sensing lever shaft (25) in the ribbon feed mounting bracket (50); secure with a setscrew (24).

(9) Position the ribbon feeding detent wheels (23) on the ribbon spool shaft (27). Position the ratchet feed detents (22) on the sensing levers (21); position the assembled sensing levers and ratchet wheel detents on the sensing lever shaft (25).

(10) Position the two holding clip brackets (20) on the ribbon feed mounting bracket (50); secure with four machine screws (18) and lockwashers (19).

(11) Install the two ribbon retainer lever springs (17) on the holding clip brackets (20) and on the ratchet feed detent (22). Install the two ribbon feed detent lever springs (16) on the holding clip bracket and on the ribbon feed levers (39).

(12) Position the ribbon retainer shaft (14) on the holding clip brackets (20). Position the ribbon retainer levers (15) on the ribbon retainer shaft. Position the two ribbon retainer lever springs (13) on the ribbon retainer levers and the holding clip brackets. Secure the ribbon retainer levers to the ribbon retainer shaft with six retainer rings (12).

(13) Position the eccentric stud (11) on the ribbon feed mounting bracket (50); secure with a setscrew (10).

(14) Position the flat washer (9) and the ribbon feed cam follower (8) on the eccentric stud (11); secure with a retainer ring (7).

(15) Install the ribbon feed cam follower spring (6) on the spring post on the ribbon feed mounting bracket (50) and on the ribbon feed cam follower (8).

(16) Install the ribbon supply group on the perforator as described in paragraph 253*b*.

(17) Adjust the ribbon supply group as described in paragraphs 489 through 491.

255. Removal and Replacement of Front Support Assembly

(fig. 268)

a. Removal.

(1) Remove the ribbon supply group as described in paragraph 253*a*.

(2) Remove the three machine screws (1) and lockwashers (2) that hold the front support frame (66) to the perforator frame.

(3) Remove the two machine screws (3) and lockwashers (4) that hold the bearing block (5) to the front support frame (66).

(4) Remove the two machine screws (7 and 9) and lockwashers (8 and 10) that hold the chad tube (11) to the front support frame (66); remove the chad tube.

(5) Drop the front support assembly far enough to allow the punch interference levers to clear the code rings; remove the front support assembly.

b. Replacement.

(1) Position the front support assembly on the perforator frame so that each of the punch interference levers engage a code ring in the code ring cage.

(2) Position the chad tube (11) on the front support frame (66); secure with two machine screws (9 and 7) and two lock washers (10 and 8).

(3) Position the bearing block (5) on the front support frame (66); secure with two machine screws (3) and lockwashers (4).

(4) Secure the front support frame to the perforator frame with three machine screws (1) and lockwashers (2).

(5) Install the ribbon supply group as described in paragraph 253*b*.

256. Disassembly and Reassembly of Tape Feed Mechanism

(fig 269)

a. Disassembly.

(1) Remove the front support assembly from the perforator as described in paragraph 255*a*.

(2) Remove the back space pawl spring (1) from the back space lever (8) and from the back space pawl (4).

(3) Remove the self-locking hexagonal nut (2) that holds the back space pawl (4) to the back space lever (8); remove the pivot screw (3) and back space pawl.

(4) Remove the back space lever spring (5) from the back space lever (8) and from the terminal lug on the code die support.

(5) Remove the back space pivot stud (6) that holds the back space lever (8) to the front support frame; remove the collar (7) and the back space lever.

(6) Remove the detent lever spring (9) from the retainer mounting bracket (18) and from the detent lever (11).

(7) Remove the retainer ring (10) that holds the detent lever (11) to the eccentric stud (13); remove the detent lever.

(8) Remove the self-locking hexagonal nut (12) that holds the eccentric stud (13) to the code die support; remove the eccentric stud.

(9) Remove the retainer ring (14) that holds the tape retainer assembly (15) to the stud on the retainer mounting bracket (18); remove the tape retainer assembly and the tape retainer spring (16).

(10) Remove the two machine screws (17) and lockwashers (21) that hold the retainer mounting bracket (18) to the code die support; remove the retainer mounting bracket, tape guide (19), and tape tear wire (20).

(11) Remove the two setscrews (22) that hold the detent wheel (25) to the ratchet wheel (24). Remove the two setscrews (23) that hold the tape feed sprocket (26) to the ratchet wheel. Remove the ratchet wheel, catching the detent wheel and tape feed sprocket as they fall from the shaft of the ratchet wheel.

b. Reassembly

(1) Position the tape feed sprocket (26) and

detent wheel (25) on the code die support; install the ratchet wheel (24). Aline the tapped holes of the tape feed sprocket with the two flats on the ratchet wheel; secure with two setscrews (23). Aline the tapped holes of the detent wheel with the two flats on the shaft of the ratchet wheel; secure with two setscrews (22).

(2) Position the retainer mounting bracket (18), tape guide (19), and tape tear wire (20) on the code die support; secure with two machine screws (17) and lockwashers (21).

(3) Position the tape retainer spring (16) and tape retainer assembly (15) on the retainer mounting bracket (18); secure with a retainer ring (14).

(4) Position the eccentric stud (13) on the code die support; secure with a self-locking hexagonal nut (12).

(5) Position the detent lever (11) on the eccentric stud (13); secure with a retainer ring (10).

(6) Install the detent lever spring (9) on the retainer mounting bracket (18) and on the detent lever (11).

(7) Position the collar (7) and the back space lever (8) on the front support frame; secure with a back space pivot stud (6).

(8) Install the back space lever spring (5) on the back space lever (8) and the terminal lug on the code die support.

(9) Position the back space pawl (4) and the pawl eccentric screw (3) on the back space lever (8); secure with a self-locking hexagonal nut (2).

(10) Install the back space pawl spring (1) on the back space pawl (4) and on the back space lever (8).

(11) Adjust the tape feed mechanism as described in paragraphs 484, 485, 487, and 488.

(12) Install the front support assembly on the perforator as described in paragraph 255*b*.

257. Disassembly and Reassembly of Punch and Die Support Assembly

(fig. 270)

a. Disassembly.

(1) Remove the front support assembly from the perforator as described in paragraph 255*a*.

(2) Remove the tape feed mechanism as described in paragraph 256*a*.

(3) Remove the machine screw (1) and lockwasher (2) that hold the code die support (21) to the front support frame; remove the code die assembly and shims (3 and 4).

(4) Remove the paper guide lever spring (5) from the paper guide lever (7) and from the indicator (9).

(5) Remove the retainer ring (6) that holds the paper guide lever (7) to the paper guide lever pivot (8); remove the paper guide lever.

(6) Remove the paper guide lever pivot that holds the indicator (9) to the code die assembly (12); remove the indicator.

(7) Remove the machine screw (10) and lockwasher (11) that hold the code die assembly (12) to the code die support (21); remove the code die assembly.

(8) Remove the self-locking hexagonal nut (13) and machine screw (14) from the comb (19). Remove the machine screw (15), terminal lug (16), machine screw (17), and lockwasher (18) that hold the comb to the bottom of the code die support (21); remove the comb and the six code punch bars (20).

b. Reassembly.

(1) Position the six code punch bars (20) in the code die support (21). Position the comb (19) on the code die support (21); secure with a machine screw (17), lockwasher (18), machine screw (15), and terminal lug (16). Install the machine screw (14) and self-locking hexagonal nut (13) on the comb.

(2) Position the code die assembly (12) on the code die support (21); secure with a machine screw (10) and lockwasher (11).

(3) Position the indicator (9) on the code die assembly (12); secure with the paper guide lever pivot (8).

(4) Position the paper guide lever (7) on the paper guide lever pivot (8); secure with a retainer ring (6).

(5) Install the paper guide lever spring (5) on the paper guide lever (7) and on the indicator (9).

(6) Position the code die support (21) and shims (3 and 4) on the front support

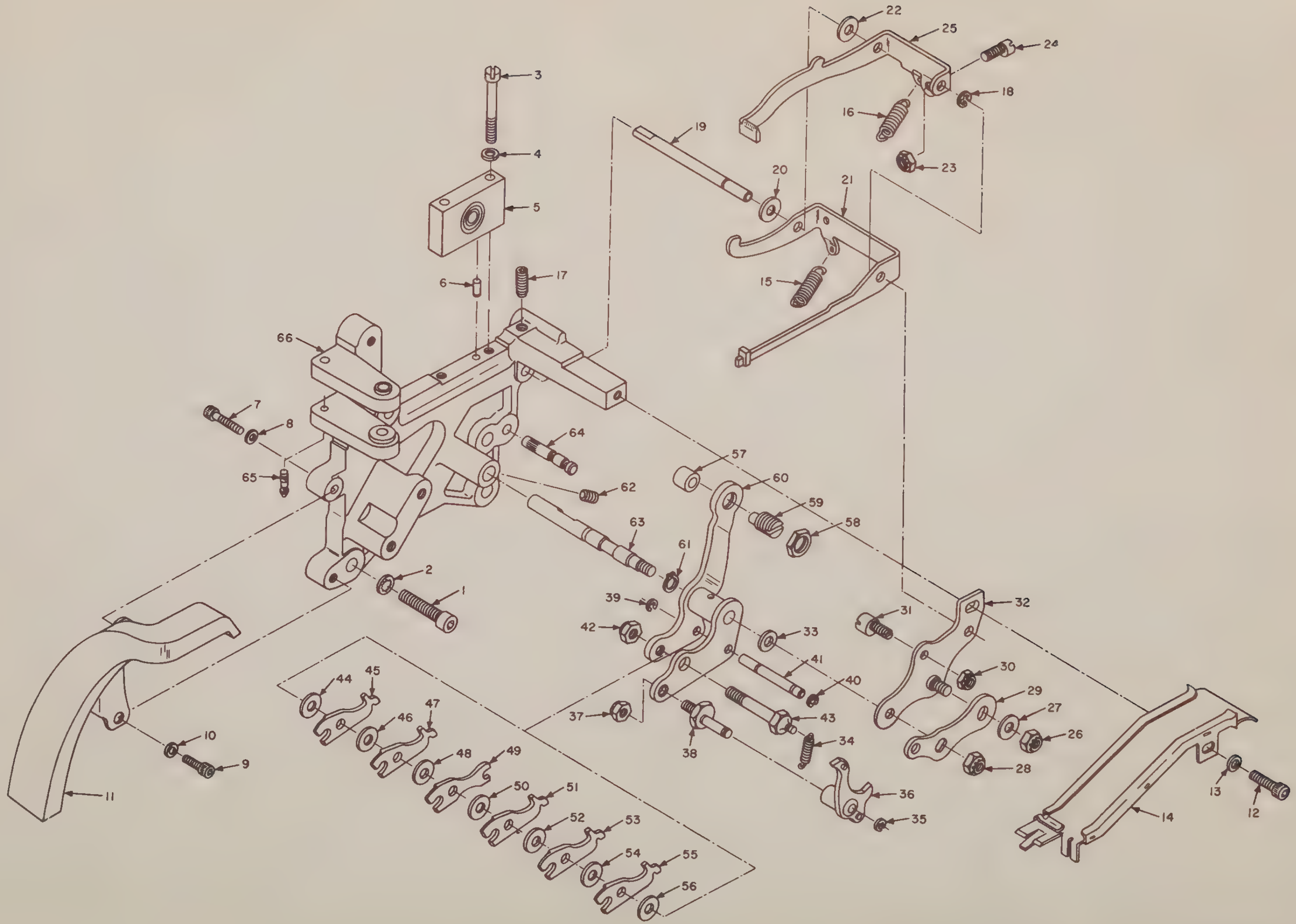


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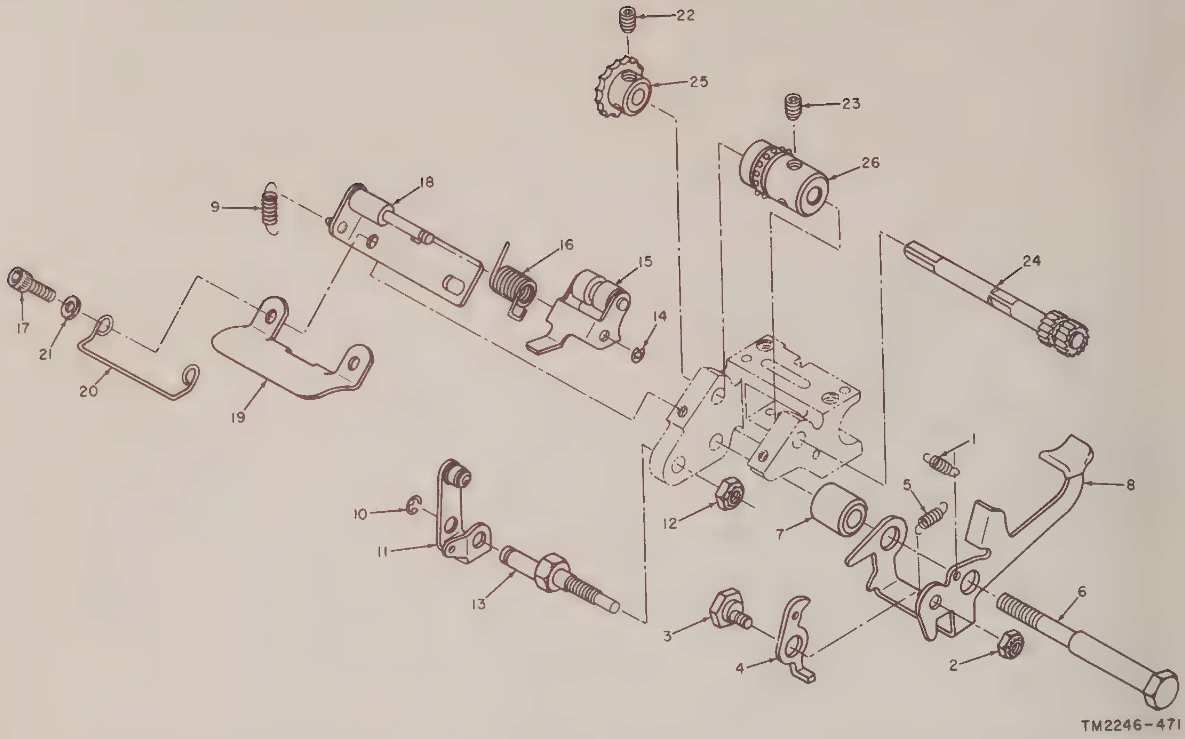
Figure 268. Front support assembly, exploded view.

1 Machine screw, 10035–01
2 Lockwasher, 10405
3 Machine screw, 10063
4 Lockwasher, 10430
5 Bearing block, 55131
6 Dowel
7 Machine screw, 10010
8 Lockwasher, 10430
9 Machine screw, 10025
10 Lockwasher, 10430
11 Chad tube, 55760A
12 Machine screw, 10009
13 Lockwasher, 10430
14 Tape chute, 52489A
15 Print hammer lever spring, 52163
16 Register lever spring, 56158
17 Setscrew, 10211
18 Retainer ring, 10949
19 Print and register levers shaft, 52486
20 Flat washer, 52651
21 Print hammer lever, 52436A
22 Flat washer, 52651
23 Self-locking hexagonal nut, 10501
24 Print hammer eccentric stop, 52485
25 Type wheel register lever, 52432
26 Self-locking hexagonal nut, 10525
27 Flat washer, 10464
28 Self-locking hexagonal nut, 10525
29 Adjusting plate 52493
30 Self-locking hexagonal nut, 10501
31 Print hammer eccentric stop, 52485
32 Support plate, 52321
33 Flat washer, 52651
34 Feed pawl spring, 52164
35 Retainer ring, 10960
36 Feed pawl assembly, 52331A
37 Self-locking hexagonal nut, 10501
38 Feed pawl pivot, 52329
39 Retainer ring, 10960
40 Retainer ring, 10960
41 Code and feed hole punch lever stop pin, 52327
42 Self-locking hexagonal nut, 10525
43 Pivot stud, 52409
44 Flat washer, 52446
45 Code hole punch lever, 52346
46 Flat washer, 52446
47 Code hole punch lever, 52346
48 Flat washer, 52446
49 Feed punch lever, 52347
50 Flat washer, 52446
51 Code hole punch lever, 52346
52 Flat washer, 52446
53 Code hole punch lever, 52346
54 Flat washer, 52446
55 Code hole punch lever, 52346
56 Flat washer, 52446
57 Cam roller, 52354
58 Plain hexagonal nut, 10526
59 Eccentric stud, 52365
60 Punch arm assembly, 52337A
61 Retainer ring, 10971
62 Setscrew, 10210
63 Punch arm pivot post, 52345
64 Register and print levers spring post, 52451
65 Spring post, 51133
66 Front support frame, 55130A

Figure 268—Continued.



1 Back space pawl spring, 52192
2 Self-locking hexagonal nut, 10500
3 Pawl eccentric screw, 52643
4 Back space pawl, 52709
5 Back space lever spring, 52193
6 Back space pivot stud, 52644
7 Collar, 52645
8 Back space lever, 52654
9 Detent lever spring, 52166
10 Retainer ring, 10949
11 Detent lever, 52455A
12 Self-locking hexagonal nut, 10501
13 Eccentric stud, 52342
14 Retainer ring, 10969
15 Tape, retainer assembly, 52126A
16 Tape retainer spring, 52422
17 Machine screw, 10003
18 Retainer mounting bracket, 52681A
19 Tape guide, 52519
20 Tape tear wire, 56164
21 Lockwasher, 10429
22 Setscrew, 10201
23 Setscrew, 10201
24 Ratchet wheel, 52442A
25 Detent wheel, 52384
26 Tape feed sprocket, 52377

Figure 269. Tape feed mechanism, exploded view.

frame; secure with a machine screw (1) and lockwasher (2).

(7) Adjust the code die group as described in paragraphs 479, 480, 481, 482, and 483.

(8) Install the tape feed mechanism as described in paragraph 256*b*.

(9) Install the front support assembly on the perforator as described in paragraph 255*b*.

258. Disassembly and Reassembly of Type Wheel Group

(fig. 271)

a. Disassembly.

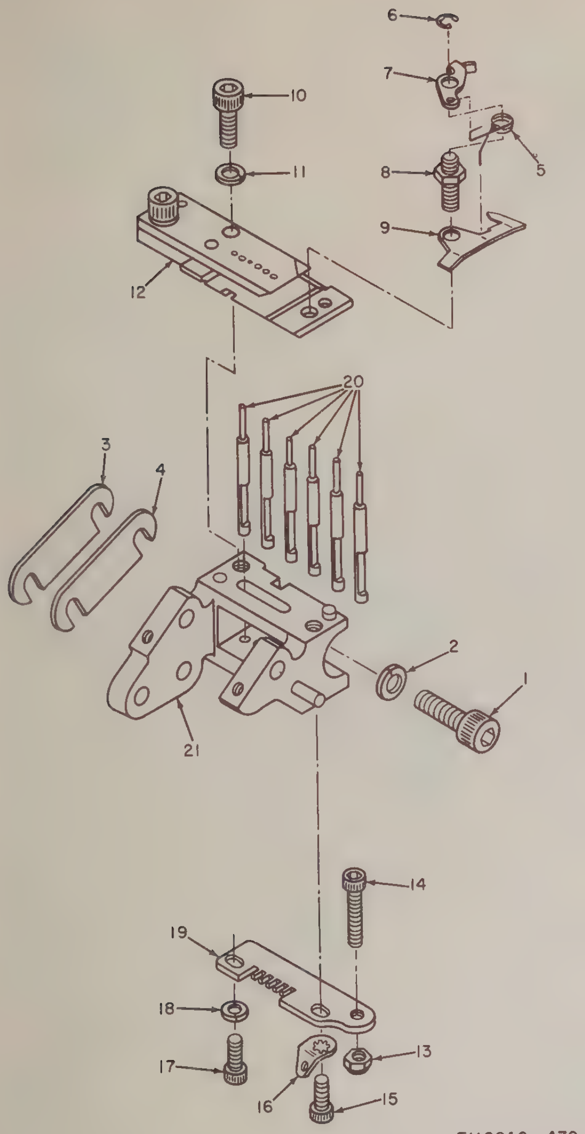
(1) Remove the cotter pin (1) that holds the ribbon guide (3) to the stud on the type wheel lower bell crank lever (13); remove the flat washer (2), ribbon guide, and flat washer (4).

(2) Remove the machine screw (5), and nut plate (6), and flat washer (7) that hold the type wheel upper bell crank lever (8) to the reciprocating lever shaft (16); remove the type wheel upper bell crank lever.

(3) Remove the type wheel bell crank lever spring (12) from the type wheel lower bell crank lever (13) and from the spring post on the front support frame.

(4) Remove the machine screw (9), nut plate (10), and flat washer (11) that hold the type wheel lower bell crank lever (13) to the reciprocating lever shaft (16); remove the type wheel lower bell crank lever.

(5) Remove the two setscrews (14) that hold the shaft collar (17) to the reciprocating lever shaft (16). Remove the two setscrews (15) that hold the shaft collar (18)



1	Machine screw, 10017-01
2	Lockwasher, 10431
3	Shim, 52577
4	Shim, 52578
5	Paper guide lever spring, 56396
6	Retainer ring, 10969
7	Paper guide lever, 56163
8	Paper guide lever pivot, 56161
9	Indicator, 56397
10	Machine screw, 10009
11	Lockwasher, 10430
12	Code die assembly, 53543A
13	Self-locking hexagonal nut, 10500
14	Machine screw, 10006
15	Machine screw, 10003
16	Terminal lug, 20795
17	Machine screw, 10003
18	Lockwasher, 10429
19	Comb, 52355
20	Code punch bars, 52373A
21	Code die support, 52372

Figure 270. Punch and die support assembly, exploded view.

to the reciprocating lever shaft; remove the reciprocating lever shaft, catching the shaft collars as they fall from the shaft.

(6) Remove the assembled type wheel hub assembly (22) and type wheel (21) from the type wheel post (24). Remove the three machine screws (19) that hold the type wheel clamp plate mounting disk (20) to the type wheel hub assembly; remove the mounting disk and type wheel.

(7) Remove the setscrew (23) that holds the type wheel post (24) to the front support frame; remove the type wheel post.

b. *Reassembly.*

(1) Position the type wheel post (24) in the front support frame; secure with a setscrew (23).

(2) Position the type wheel (21) and type wheel clamp plate mounting disk (20) on the type wheel hub assembly (22); secure with three machine screws (19). Position the type wheel assembly on the type wheel post.

(3) Position the shaft collars (17 and 18) on the front support frame; install the reciprocating lever shaft (16). Install two setscrews (15 and 14) in each of the shaft collars to secure the shaft collars to the shaft.

(4) Position the type wheel lower bell crank lever (13) on the reciprocating lever shaft (16); secure with a machine screw (9), flat washer (11), and nut plate (10).

(5) Install the type wheel bell crank lever spring (12) on the type wheel lower bell crank lever (13) and on the spring post on the front support frame.

(6) Position the type wheel upper bell crank lever (8) on the reciprocating lever shaft (16); secure with a machine screw (5), nut plate (6), and flat washer (7).

(7) Position the flat washer (4), ribbon guide (3), and flat washer (2) on the stud on the type wheel lower bell crank lever (13); secure with a cotter pin (1).

(8) Adjust the type wheel group as directed in paragraphs 470, 471, 472, 473, and 475.

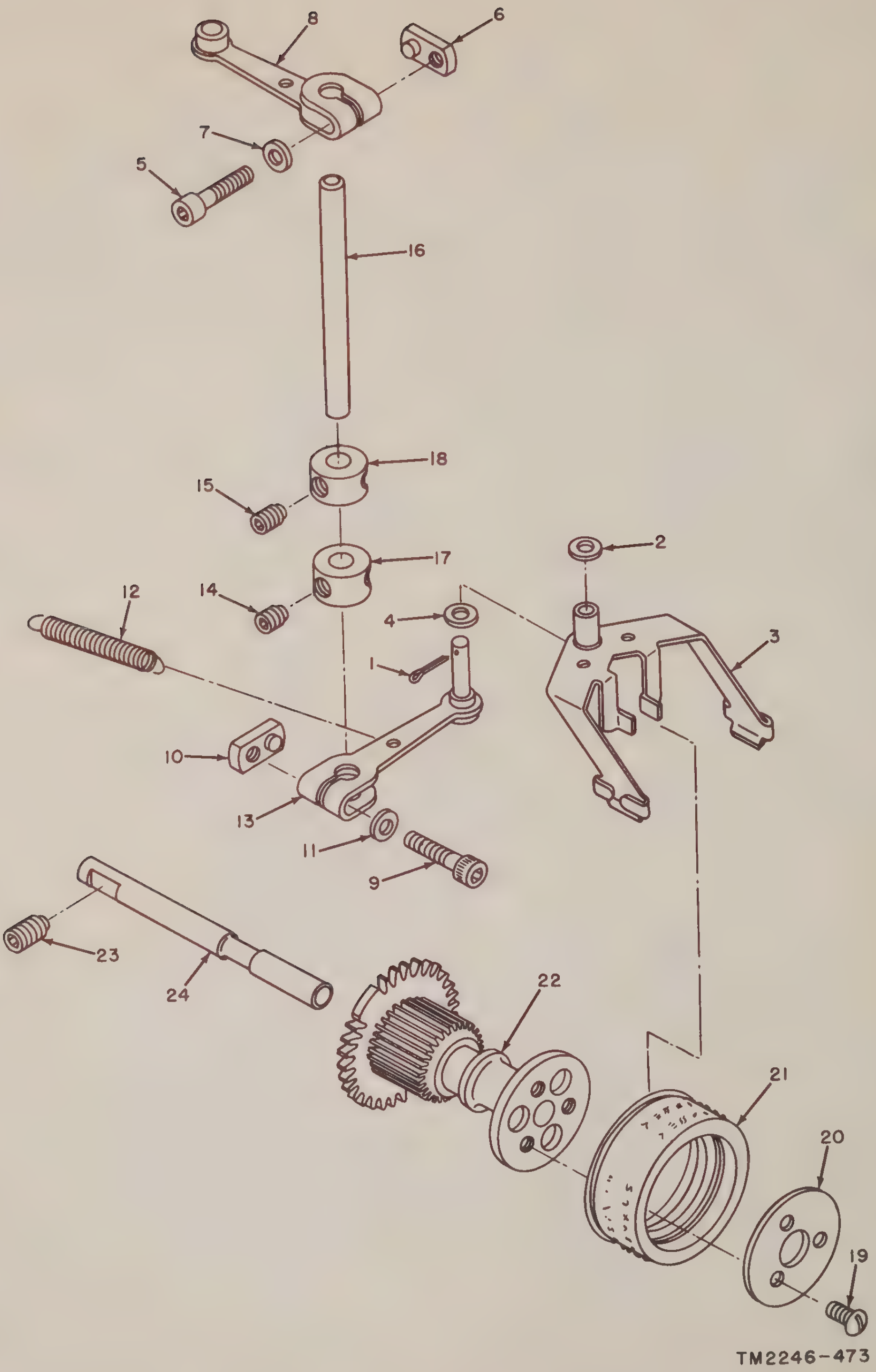


Figure 271. Type wheel group, exploded view.

1 Cotter pin, 10806
2 Flat washer, 50320
3 Ribbon guide, 52416A
4 Flat washer, 50320
5 Machine screw, 10006
6 Nut plate, 50174
7 Flat washer, 10459
8 Type wheel upper bell crank lever, 52482
9 Machine screw, 10006
10 Nut plate, 50174
11 Flat washer, 10459
12 Type wheel bell crank lever spring, 52161
13 Type wheel lower bell crank lever, 52480
14 Setscrew, 10201
15 Setscrew, 10201
16 Reciprocating lever shaft, 52414
17 Shaft collar, 50391
18 Shaft collar, 50391
19 Machine screw, 10305
20 Type wheel clamp plate mounting disk, 52407
21 Type wheel, 52461
22 Type wheel hub assembly, 52380
23 Setscrew, 10210
24 Type wheel post, 52418

Figure 271—Continued.

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259. Disassembly and Reassembly of Punch Interference Levers

(fig. 272)

a. Disassembly.

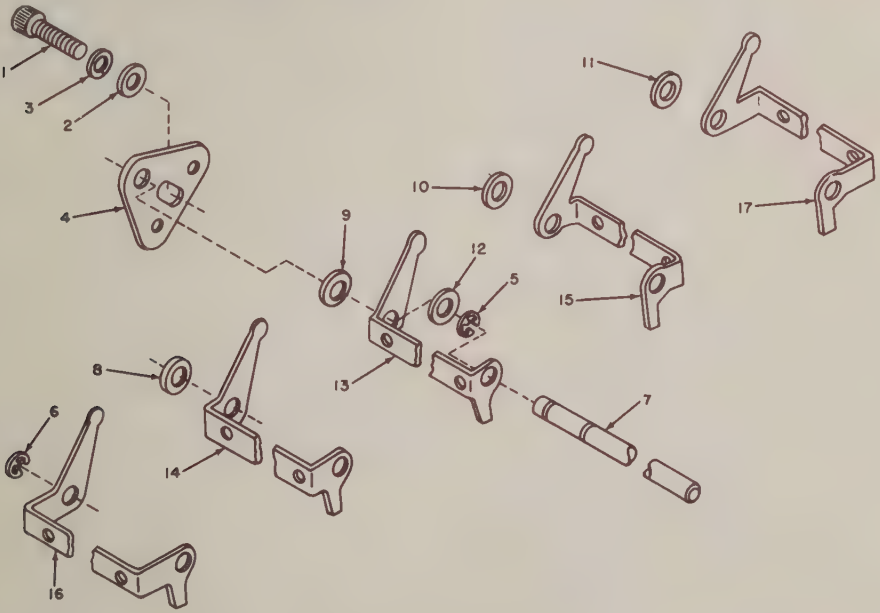
(1) Remove the front support assembly from the perforator as described in paragraph 255*a*.

(2) Remove the machine screw (1), flat washer (2), and lockwasher (3) that hold the interference lever shaft support plate (4) to the front support frame; remove the interference lever shaft support plate and the assembled punch interference levers from the front support assembly.

(3) Remove the two retainer rings (5 and 6) that hold the punch interference levers (13, 14, 15, 16, and 17) to the interference lever shaft (7); remove the punch interference lever shaft to release the five flat washers (8, 9, 10, 11, and 12) and the five punch interference levers.

b. Reassembly.

(1) Position the five punch interference levers (13, 14, 15, 16, and 17) so that the holes in the sides of the levers are alined. Position a flat washer (8, 9, 10, 11, and 12) between each pair of punch interference levers and between the inner retain-



1 Machine screw, 10009
2 Flat washer, 10463
3 Lock washer, 10430
4 Interference lever shaft support plate, 52334
5 Retainer ring, 10949
6 Retainer ring, 10949
7 Interference lever shaft, 52452
8 Flat washer, 52430
9 Flat washer, 52430
10 Flat washer 52430
11 Flat washer, 52430
12 Flat washer, 50831
13 Punch interference lever, No. 1, 52424.
14 Punch interference lever, No. 3, 52427
15 Punch interference lever No. 2, 52426
16 Punch interference lever No. 5, 52429
17 Punch interference lever, No. 4, 52428

Figure 272. Punch interference levers, exploded view.

ing ring groove and punch interference lever. Install the interference lever shaft (7) in the punch interference levers; secure with two retainer rings (5 and 6).

(2) Position the assembled punch interference levers and interference lever shaft on the front support assembly. Position the interference lever shaft support plate (4) on the front support frame so that it engages the interference lever shaft; secure with a machine screw (1), lockwasher (3), and flat washer (2).

(3) Install the front support assembly on the perforator as described in paragraph 255*b*.

(4) Adjust the punch interference levers as instructed in paragraph 480.

260. Disassembly and Reassembly of Front Support Frame

(fig. 268)

a. Disassembly.

(1) Remove the front support assembly from the perforator as described in paragraph 255*a*.

(2) Remove the tape feed mechanism from the front support assembly as described in paragraph 256*a*.

(3) Remove the punch and die support assembly from the front support assembly as described in paragraph 257*a*.

(4) Remove the type wheel group from the front support assembly as described in paragraph 258*a*.

(5) Remove the punch interference levers from the front support assembly as described in paragraph 259*a*.

(6) Remove the machine screw (12) and lockwasher (13) that hold the tape chute (14) to the front support frame (66); remove the tape chute.

(7) Remove the print hammer lever spring (15) from the print hammer lever (21) and from the register and print levers spring post (64) on the front support frame (66). Remove the register lever spring (16) from the type wheel register lever (25) and from the spring post on the front support frame.

(8) Remove the setscrew (17) that holds the print and register levers shaft (19) in the front support frame (66); remove the assembled print hammer lever (21), type wheel register lever (25), and print and register levers shaft from the front support frame.

(9) Remove the retainer ring (18) that holds the print hammer lever (21) and type wheel register lever (25) to the print and register levers shaft; remove the print and register levers shaft (19) to release the flat washer (20), print hammer lever, flat washer (22), and type wheel register lever.

(10) Remove the self-locking hexagonal nut (23) that holds the print and hammer eccentric stop (24) to the type wheel register lever (25); remove the print and hammer eccentric stop.

(11) Remove the self-locking hexagonal nut (26), flat washer (27), and self-locking hexagonal nut (28) that hold the adjusting plate (29) to the support plate (32); remove the adjusting plate, support plate, flat washer (33), and punch arm assembly (60) from the punch arm pivot post (63).

(12) Remove the self-locking hexagonal nut (30) that holds the print hammer eccentric stop (31) to the support plate; remove the print hammer eccentric stop.

(13) Remove the feed pawl spring (34) from the pivot stud (43) and from the feed pawl assembly (36).

(14) Remove the retainer ring (35) that holds the feed pawl assembly (36) to the feed pawl pivot (38); remove the feed pawl assembly.

(15) Remove the self-locking hexagonal nut (37) that holds the feed pawl pivot (38) to the punch arm assembly (60); remove the feed pawl pivot.

(16) Remove the two retainer rings (39) and (40) that hold the code and feed hole punch lever stop pin (41) to the punch arm assembly (60); remove the code feed hole punch lever stop pin.

(17) Remove the self-locking hexagonal nut (42) that holds the pivot stud (43) to the punch arm assembly (60); remove the pivot stud, catching the seven flat washers (44, 46, 48, 50, 52, 54, and 56); code hole punch levers (45, 47, 51, 53, and 55) and the feed punch lever (49) as they fall from the pivot stud.

(18) Remove the cam roller (57) from the eccentric stud (59) on the punch arm assembly (60). Remove the plain hexagonal

nut (58) and eccentric stud from the punch arm assembly.

(19) Remove the retainer ring (61) from the punch arm pivot post (63). Remove the setscrew (62) that holds the punch arm pivot post to the front support frame; remove the punch arm pivot post.

b. Repair of Front Support Frame. If any of the spring posts are loose or damaged, replace the damaged post. Support the front support frame near the spring post to be removed to prevent distortion to the frame when pressing out the spring posts. Press the new post into the frame at right angles to the plane of the frame. Replace a frame that has worn threads, enlarged holes, or is otherwise damaged.

c. Reassembly.

(1) Position the punch arm pivot post (63) in the front support frame (66); secure with a setscrew (62). Install the retainer ring (61) on the punch arm pivot post.

(2) Install the eccentric stud (59) and plain hexagonal nut (58) on the punch arm assembly (60); install the cam roller (57) on the eccentric stud.

(3) Position the seven flat washers (56, 54, 52, 50, 48, 46, and 44); five code hole punch levers (55, 53, 51, 47, and 45), and the feed punch lever (49) on the punch arm assembly (60), starting at the front of the punch arm assembly with a flat washer alternated with a code hole punch lever until four flat washers and three code hole punch levers are positioned. Follow with the feed punch lever and continue alternating flat washers and code hole punch levers until all are positioned. Position the pivot stud (43) through the punch arm assembly, flat washers, code hole punch levers, and feed punch lever; secure with a self-locking hexagonal nut (42).

(4) Position the code and feed hole punch lever stop pin (41) in the punch arm assembly (60), making sure the stop pin engages the notch at the back of the code hole punch levers. Secure with two retainer rings (40) and (39).

(5) Position the feed pawl pivot (38) on the punch arm assembly; secure with a self-locking hexagonal nut (37).

(6) Position the feed pawl assembly (36) on the feed pawl pivot (38); secure with a retainer ring (35).

(7) Install the feed pawl spring (34) on the feed pawl assembly (36) and on the pivot stud (43).

(8) Position the print hammer eccentric stop (31) on the support plate (32); secure with a self-locking hexagonal nut (30).

(9) Position the punch arm assembly (60), flat washer (33), support plate (32), and adjusting plate (29) on the punch arm pivot post (63); secure with a self-locking hexagonal nut (28). Secure the adjusting plate to the support plate with a flat washer (27) and self-locking hexagonal nut (26).

(10) Position the print hammer eccentric stop (24) on the type wheel register lever (25); secure with a self-locking hexagonal nut (23).

(11) Position the type wheel register lever (25), flat washer (22), print hammer lever (21), and flat washer (20) on the print and register levers shaft (19); secure with a retainer ring (18).

(12) Position the assembled print and register levers shaft (19), print hammer lever (21), and type wheel register lever (25) on the front support frame (66) so that the shaft enters the hole in the front support frame; secure with a setscrew (17).

(13) Install the register lever spring (16) on the type wheel register lever (25) and on the register and print levers spring post (64) on the front support frame (66). Install the print hammer lever spring (15) on the print hammer lever (21) and on the spring post on the front support frame.

(14) Position the tape chute (14) on the front support frame (66); secure with a machine screw (12) and lockwasher (13).

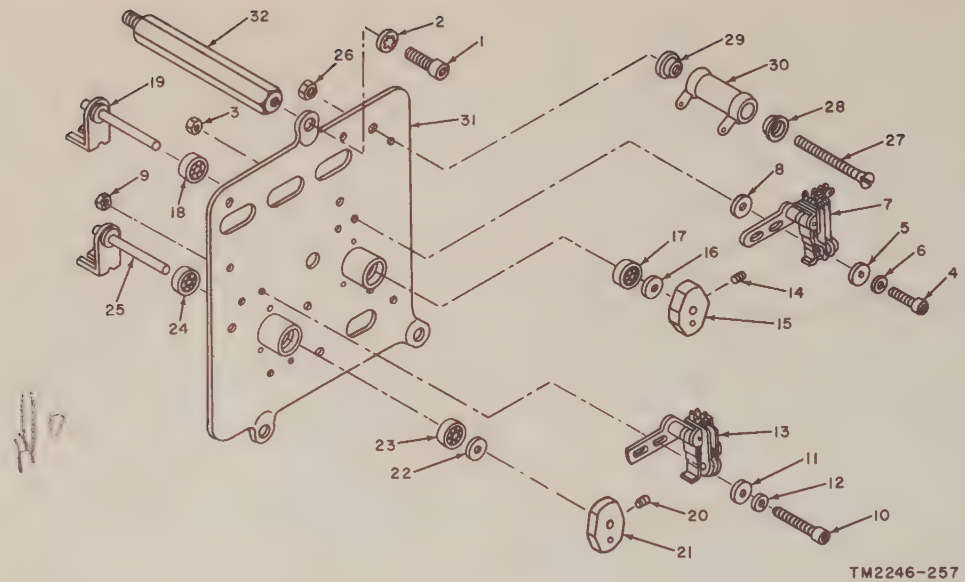
(15) Install the punch interference levers as described in paragraph 259*b*.

(16) Install the type wheel group as described in paragraph 258*b*.

(17) Install the punch and die support assembly as described in paragraph 257*b*.

(18) Install the tape feed mechanism on the front support assembly as described in paragraph 256*b*.

(19) Install the front support assembly on the



1	Machine screw, 10024
2	Lockwasher, 10405
3	Self-locking hexagonal nut, 10500
4	Machine screw, 10004
5	Flat washer, 10450
6	Lockwasher, 10429
7	Perforator latch pulsing contacts S20
8	Flat washer, 10450
9	Self-locking hexagonal nut, 10500
10	Machine screw, 10034
11	Flat washer, 10450
12	Lockwasher, 10429
13	Receiving multisolenoid pulsing contacts, 54572A
14	Setscrew, 10210
15	Perforator latch pulsing cam, 56008
16	Flat washer, 50315
17	Ball bearing, 10755
18	Ball bearing, 10755
19	Camshaft, 56015A
20	Setscrew, 10210
21	Receiving multisolenoid pulsing cam, 56010
22	Flat washer, 50315
23	Ball bearing, 10755
24	Ball bearing, 10755
25	Camshaft, 56015A
26	Self-locking hexagonal nut, 10551
27	Machine screw, 10183
28	Washer, 20878
29	Washer, 20879
30	Resistor, R7
31	Mounting bracket, 56060A
32	Stud, 56154

Figure 273. Pulsing contact mounting bracket assembly, exploded view.

perforator as described in paragraph 255*b*.

(20) Adjust the front support assembly as described in paragraphs 474 through 485.

261. Removal and Replacement of the Pulsing Contact Assembly

(fig. 273)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the three machine screws (1) that hold the mounting bracket (31) to the studs (32) on the perforator frame.

(3) Remove the pulsing contact assembly by carefully pulling it forward free of the perforator function shafts.

b. Replacement.

(1) Position the pulsing contact assembly on the perforator frame, making sure that the arms of the camshafts (19) and (25) engage the mounting clutch setscrews on the two function shafts.

(2) Secure the mounting bracket (31) to the three studs (32) on the perforator frame with three machine screws (1) and lockwashers (2).

(3) Install the perforator on the perforator base as described in paragraph 229*b*.

262. Disassembly and Reassembly of Pulsing Contact Assembly Cover and Wiring

(fig. 274)

a. Disassembly.

(1) Remove the pulsing contact assembly from the perforator as described in paragraph 261*a*.

(2) Remove the three machine screws (1) and lockwashers (2) that hold the filter box cover (3) to the mounting bracket; remove the filter box cover.

(3) Remove the three machine screws (4) and

lockwashers (5) that hold the three standoffs (6) to the mounting bracket; remove the standoffs. Remove the electrical clamp (14) and cable assembly (9) from the mounting bracket.

(4) Remove the self-locking hexagonal nut (7), lockwasher (8), ground lead from the cable assembly (9), and lockwasher (10) that hold one corner of the rf filter (15) to the mounting bracket. Remove the three self-locking hexagonal nuts (11) and lockwashers (12) that hold the rf filter to the mounting plate. Remove the two electrical clamps (13) and (14) and unsolder the electrical leads from the rf filter; remove the rf filter.

(5) Remove the two machine screws (16) and lockwashers (17) that hold the electrical noise suppressor (18) to the mounting bracket; unsolder the electrical leads and remove the electrical noise suppressor from the mounting plate.

(6) Remove the grommet (19) from the mounting bracket.

(7) Remove the connector plug (20) from the cable assembly (9).

(8) Unsolder all the leads from the electrical contacts on the mounting bracket; remove the tubing (21) from the electrical leads. Tag all electrical leads to facilitate reassembly.

b. Reassembly.

(1) Connect all leads to the electrical contacts on the mounting bracket. Install the tubing (21) on the wires before connecting the leads. Position the tubing to shield the solder connections.

(2) Connect the connector plug (20) to the cable assembly (9).

(3) Install the grommet (19) on the mounting bracket.

(4) Solder the electrical leads to the electrical noise suppressor (18). Position the electrical noise suppressor on the mounting bracket; secure with two machine screws (16) and lockwashers (17).

(5) Solder the electrical leads to the rf filter (15). Install the electrical clamps (13) and (14) on the cable. Position the rf filter on the mounting bracket; secure with three lockwashers (12) and self-locking hexagonal nuts (11). Secure the electrical clamp (13) with the self-locking hexagonal nut that secures the lower right-hand corner of the rf filter. Secure the lower left-hand corner of the rf filter with a lockwasher (10), ground lead from the cable assembly (9), lockwasher (8), and self-locking hexagonal nut (7).

(6) Position the three standoffs (6) on the mounting plate; secure with three machine screws (4) and lockwashers (5). Secure the electrical clamp (14) with the same machine screw that holds the lower right standoff.

(7) Position the filter box cover (3) on the pulsing contact assembly; secure with three machine screws (1) and lockwashers (2).

(8) Install the pulsing contact assembly on the perforator as described in paragraph 261*b*.

263. Disassembly and Reassembly of Pulsing Contact Mounting Bracket Assembly

a. Disassembly.

(1) Remove the pulsing contact assembly from the perforator as described in paragraph 261*a*.

(2) Remove the pulsing contact assembly cover and wiring as described in paragraph 262*a*.

(3) Remove the two self-locking hexagonal nuts (3), machine screws (4), flat washers (5), and lockwashers (6) that hold the perforator latch pulsing contacts (7) to the mounting bracket (36); remove the perforator latch pulsing contacts and two flat washers (8).

(4) Remove the two self-locking hexagonal nuts (9), machine screws (10), flat washers (11), and lockwashers (12) that hold the receiving multisolenoid pulsing contacts (13) to the mounting bracket; remove the receiving multisolenoid pulsing contacts.

(5) Remove the setscrew (14) that holds the perforator latch pulsing cam (15) to the camshaft (19); remove the cam and flat washer (16).

(6) Remove the ball bearing (17) from the mounting bracket (31). Remove the assembled camshaft (19) and ball bearing (18); remove the ball bearing from the camshaft.

(7) Remove the setscrew (20) from the receiv-

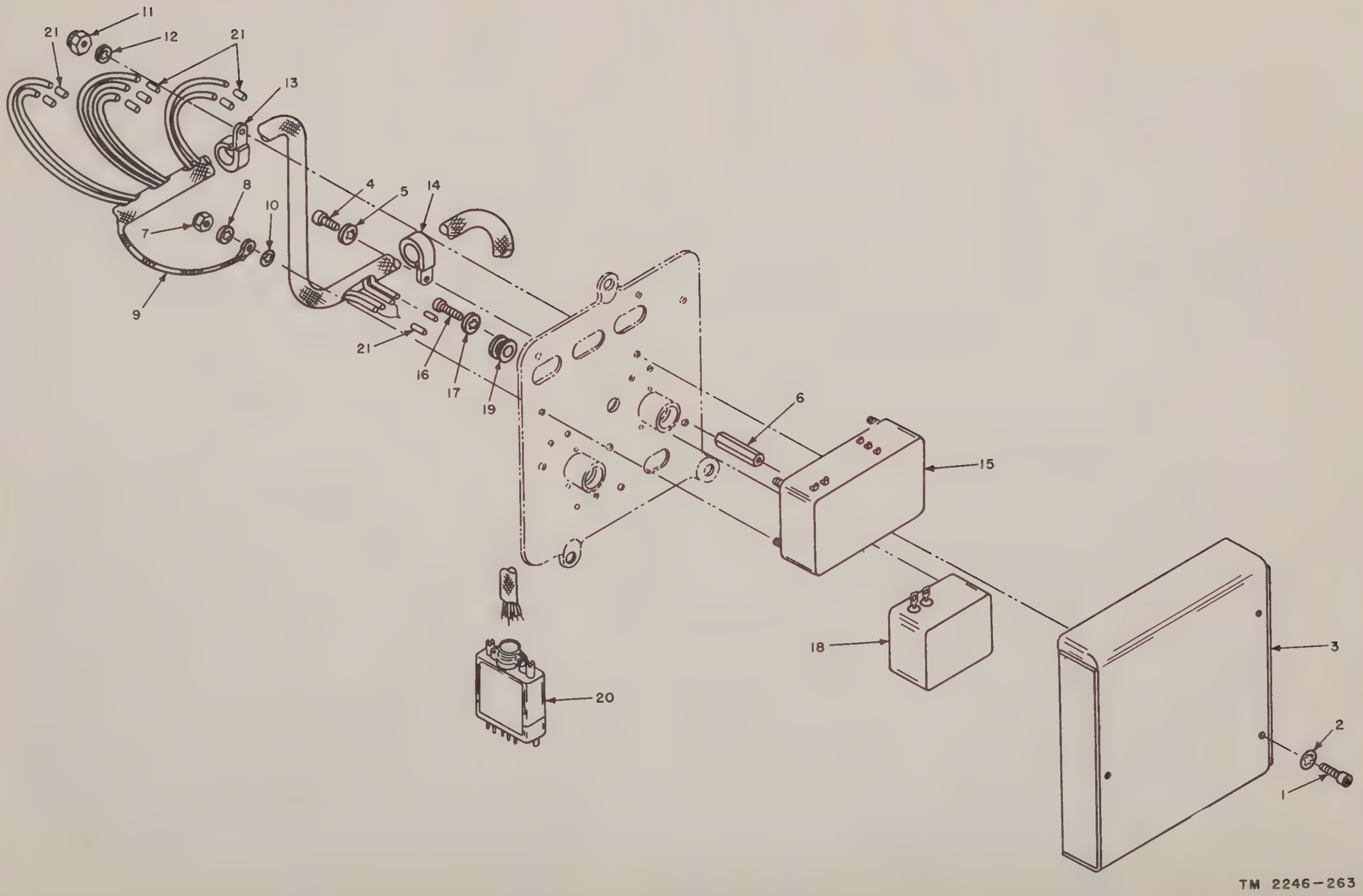


Figure 274. Pulsing contact assembly cover and wiring, exploded view.

1	Machine screw, 10064	8	Lockwasher, 10404	15	Rf filter Z5
2	Lockwasher, 10403	9	Cable assembly, 56804A	16	Machine screw, 10064
3	Filter box cover, 56018	10	Lockwasher, 10404	17	Lockwasher, 10403
4	Machine screw, 10064	11	Self-locking hexagonal nut, 10501	18	Electrical noise suppressor, Z4
5	Lockwasher, 10403	12	Lockwasher, 10404	19	Grommet, 21002
6	Standoff, 56017	13	Electrical clamp, 20519	20	Connector plug, 20427
7	Self-locking hexagonal nut, 10501	14	Electrical clamp, 20519	21	Tubing, 20732–01

Figure 274—Continued.

ing multisolenoid pulsing cam (21); remove the receiving multisolenoid pulsing cam (21), and flat washer (22) from the camshaft (25).

(8) Remove the assembled camshaft (25) and ball bearing (24) from the mounting bracket (31). Remove the ball bearing (23) from the mounting bracket. Remove the ball bearing (24) from the camshaft (25).

(9) Remove the self-locking hexagonal nut (26) and machine screw (27) securing the resistor (30) to the mounting bracket (31); remove the resistor (30) and two washers (28 and 29).

(10) Remove the three studs (32) from the perforator frame.

b. Reassembly.

(1) Install the three studs (32) on the perforator frame.

(2) Position a washer (29) and the resistor (30) on the mounting bracket (31); secure with a washer (28), machine screw (27), and self-locking hexagonal nut (26).

(3) Position the ball bearing (24) on the camshaft (25). Install the assembled ball bearing and camshaft in the mounting bracket (31). Install the ball bearing (23) on the camshaft, pressing it into the bearing seat in the mounting bracket (31).

(4) Position the flat washer (22), and receiving multisolenoid pulsing cam (21) on the camshaft (25); secure the cam to the camshaft with a setscrew (20).

(5) Position the ball bearing (18) on the camshaft (19). Position the assembled camshaft and ball bearing on the mounting bracket (31). Install the ball bearing (17) on the camshaft, pressing it into the bearing seat in the mounting bracket (31).

(6) Position the flat washer (16) and perforator latch pulsing cam (15) on the camshaft; secure the cam with a setscrew (14).

(7) Position the receiving multisolenoid pulsing contacts (13) on the mounting bracket (31); secure with two machine screws (10), lockwashers (12), flat washers (11), and self-locking hexagonal nuts (9).

(8) Position two flat washers (8) and the perforator latch pulsing contacts (7) on the mounting bracket (36); secure with two machine screws (4), lockwashers (6), flat washers (5), and self-locking hexagonal nuts (3).

(9) Adjust the pulsing contact assembly as described in paragraphs 506 and 507.

(10) Install the pulsing contact assembly cover and wiring (par. 262).

(11) Install the pulsing contact assembly on the perforator as described in paragraph 261*b*.

264. Disassembly and Reassembly of Perforator Latch

(fig. 275)

a. Disassembly.

(1) Remove the two machine screws (1), flat washers (2), and lockwashers (3) holding the perforator latch cover (4) to the perforator latch bracket (35); remove the perforator latch cover.

(2) Remove the two machine screws (5), flat washers (6), and lockwashers (7) attaching the perforator latch bracket (35) to the frame; remove the assembled perforator latch.

(3) Remove the two machine screws (8) and lockwashers (9) that hold the capacitor (10) to the perforator latch bracket (35). Unsolder the electrical wires (32) and remove the capacitor (10).

(4) Unhook the ends of the lever latch spring (11) from the spring post on the perforator latch bracket (35) and from the tab on the lever latch (17); remove the lever latch spring.

(5) Loosen the two setscrews (12) that attach the shaft collar (13) to the latch lever pivot (20); remove the shaft collar, assembled lever latch (17), and lever latch armature (16), and the flat washer (18) from the pivot.

(6) Remove the two machine screws (14) and lockwashers (15) that attach the lever latch armature (16) to the lever latch (17); remove the armature.

(7) Remove the self-locking hexagonal nut (19) that attaches the lever latch pivot (20) to the perforator latch bracket (35); remove the lever latch pivot.

(8) Remove the two machine screws (21), flat washer (22), and lockwashers (23) securing the perforator latch coil bracket (27) to the perforator latch bracket (35). Unsolder the cable leads from the perforator

latch coils (26) and remove the assembled coils and perforator latch coil bracket (27).

(9) Remove the two machine screws (24) and lockwashers (25) that attach the perforator latch coils (26) to the perforator latch coil bracket (27); remove the coils (26).

(10) Remove the self-locking hexagonal nut (28), two internal tooth lockwashers (29 and 30), and the machine screw (31) that attach the clamp (33) and the cable shield ground terminal to the perforator latch bracket (35); remove the electrical cable (34). Remove the clamp from the electrical cable.

b. Reassembly.

(1) Position the clamp (33) on the electrical cable (34). Position the clamp on the perforator latch bracket (35); attach the clamp (33) and the cable shield ground terminal to the perforator latch bracket with a machine screw (31), two internal tooth lockwashers (30 and 29), and a self-locking hexagonal nut (28).

(2) Position the two perforator latch coils (26) on the perforator latch coil bracket (27); attach with two lockwashers (25) and machine screws (24). Solder the leads of the electrical cable to the perforator latch coil terminals.

(3) Position the perforator latch coil bracket (27) on the perforator latch bracket (35) and attach with two flat washers (22), lock washers (23), and machine screws (21).

(4) Insert the threaded end of the latch lever pivot (20) through the hole in the perforator latch bracket (35); hold in place with a self-locking hexagonal nut (19).

(5) Position the lever latch armature (16) on the lever latch (17); attach with two lockwashers (15) and machine screws (14).

(6) Place the flat washer (18), assembled lever latch (17), and the shaft collar (13) on the latch lever pivot (20). Hold the collar with two setscrews (12).

(7) Hook one end of the lever latch spring (11) on the tab on the lever latch (17) and the other end on the spring post on the perforator latch bracket (35).

(8) Position the capacitor (10) on the perforator latch bracket (35); attach with two lockwashers (9) and machine screws (8). Solder the electrical wires (32) to the capacitor and perforator latch coil terminals.

(9) Hold the perforator latch bracket (35) on the frame with two lockwashers (7), flat washers (6), and machine screws (5).

(10) Adjust the perforator latch as described in paragraphs 460 through 463.

(11) Position the perforator latch cover (4) on the perforator latch bracket (35); attach with two lockwashers (3), flat washers (2), and machine screws (1).

265. Disassembly and Reassembly of Y- and Selector-Levers

(fig. 276)

a. Disassembly.

(1) Remove the Y-lever detent springs (1, 2, 3, 4, and 5) from the Y-lever detent spring bracket (21) and from the Y-lever detents (8, 11, 13, 15, and 17).

(2) Remove the plain hexagonal nut (6) and lockwasher (7) securing the Y-lever detent eccentric sleeve (19) to the Y-lever detent pivot (20); slide the assembled eccentric sleeve and detents from the Y-lever detent pivot.

(3) Remove the Y-lever detents, flat washers (9), and detent spacers (10, 12, 14, 16, and 18) alternately from the Y-lever detent eccentric sleeve (19).

(4) Remove the Y-lever detent pivot (20) from the frame of the perforator; remove the Y-lever detent spring bracket (21).

(5) Remove the two setscrews (22 and 23) from the Y-lever retaining collar (24); remove the retaining collar. Remove the flat washers (25, 27, 29, 31, and 33) and the selector Y-levers (26, 28, 30, 32, and 34) from the Y-lever pivot post stud (37). Remove the selector lever pivot post collar (35) from the Y-lever pivot post stud.

(6) Remove the setscrew (36) that holds the Y-lever pivot post stud (37) in the frame of the perforator; remove the Y-lever pivot post stud.

(7) Remove the setscrew (38) that holds the Y-lever stop (39) in the frame of the perforator; remove the Y-lever stop. Remove the retainer ring (40) from the Y-lever stop (39).

(8) Remove the selector lever springs (41, 42, 43, 44, 45, and 46) from the selector lever

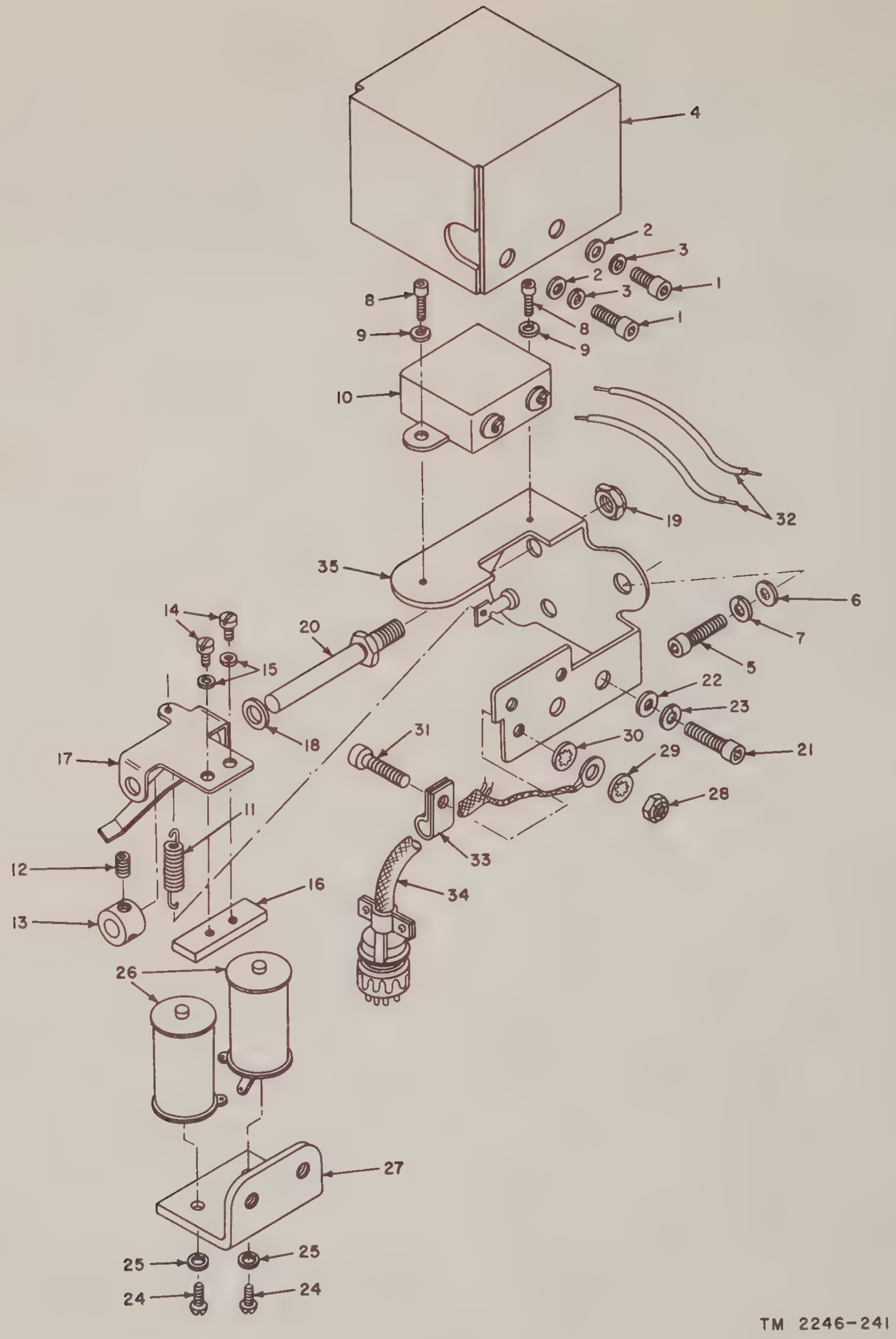


Figure 275. Perforator latch, exploded view.

spring post (69), the selector camshaft locking lever (49), and the five selector levers (51, 54, 57, 60, and 63).

(9) Remove the self-locking hexagonal nut (47), the selector camshaft lever eccentric (48), and the selector camshaft locking lever (49) from the selector lever pivot stud (67).

(10) Remove the flat washers (50, 53, 56, 59, and 62), selector levers (51, 54, 57, 60, and 63), and the sliding bearings (52, 55, 58, 61, and 64) alternately. Remove the

1 Machine screw, 10001
2 Flat washer, 10458
3 Lockwasher, 10429
4 Perforator latch cover, 56093
5 Machine screw, 10009
6 Flat washer, 10467
7 Lockwasher, 10430
8 Machine screw, 10050
9 Lockwasher, 10434
10 Capacitor C20
11 Lever latch spring, 56079
12 Setscrew, 10201
13 Shaft collar, 50391
14 Machine screw, 10254
15 Lockwasher, 10435
16 Lever latch armature, 56092
17 Lever latch, 56094
18 Flat washer, 50315
19 Self-locking hexagonal nut, 10525
20 Latch lever pivot, 56099
21 Machine screw, 10009
22 Flat washer, 10467
23 Lockwasher, 10430
24 Machine screw, 10350
25 Lockwasher, 10425
26 Perforator latch coil, 20303
27 Perforator latch coil bracket, 56096A
28 Self-locking hexagonal nut, 10500
29 Lockwasher, 10403
30 Lockwasher, 10403
31 Machine screw, 10064
32 Wire, 22099
33 Clamp, 20519
34 Electrical cable P34
35 Perforator latch bracket, 56085A

Figure 275—Continued.

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selector lever pivot post collar (65) from the selector lever pivot stud (67).

(11) Remove the setscrew (66) holding the selector lever pivot stud (67) in the frame; remove the selector lever pivot stud.

(12) Remove the selector lever spring post from the frame of the perforator; remove the plain hexagonal nut (68) from the selector lever spring post (69).

b. Reassembly.

Note. If any of the Y-levers, selector levers, or bearings are damaged and must be replaced, replace a complete set. These items are machined as matched sets. The unit will not function properly when operating with unmatched sets.

(1) Install a plain hexagonal nut (68) on the selector lever spring post (69). Install the spring post in the frame of the perforator.

(2) Install the selector lever pivot stud (67) in the frame of the perforator; hold in place with a setscrew (66).

(3) Place the selector lever pivot post collar (65) on the selector lever pivot stud (67); position the bearings (64, 61, 58, 55, and 52); the selector levers (63, 60, 57, 54, and 51); and the flat washers (62, 59, 56, and 53) on the selector lever pivot stud.

(4) Position the flat washer (50), selector camshaft locking lever (49), and selector camshaft lever eccentric (48) on the selector lever pivot stud (67); hold the assembly with a self-locking hexagonal nut (47).

(5) Hook the selector lever springs (46, 45, 44, 43, 42, and 41) on the selector lever spring post (69) and on the five selector levers (63, 60, 57, 54, and 51) and the selector camshaft locking lever (49).

(6) Install the retainer ring (40) and the Y-lever stop (39) in the frame of the perforator; hold in place with a setscrew (38).

(7) Install the selector Y-lever pivot post stud (37) in the frame of the perforator; hold with a setscrew (36).

(8) Place the selector lever pivot post collar (35) on the Y-lever pivot post stud (37); position the selector Y-levers (34, 32, 30, 28, and 26) and the flat washers (33, 31, 29, and 25) alternately on the Y-lever pivot post stud.

(9) Install the Y-lever retaining collar (24) on the Y-lever pivot post stud (37); hold with two setscrews (23 and 22).

(10) Position the Y-lever detent spring bracket (21) on the frame of the perforator; install the Y-lever detent pivot (20) to hold the Y-lever detent spring bracket on the frame.

(11) Assemble the detent spacers (18, 16, 14, 12, and 10) and the Y-lever detents (17, 15, 13, 11, and 8) alternately on the Y-lever detent eccentric sleeve (19). Install the spacer (9) between the last detent spacer and Y-lever detent.

(12) Install the assembled eccentric sleeve on the Y-lever detent pivot (20); hold with a lockwasher (7) and plain hexagonal nut (6).

(13) Hook the Y-lever detent springs (5, 4, 3, 2, and 1) on the Y-lever detents and on the Y-lever detent spring bracket (21).

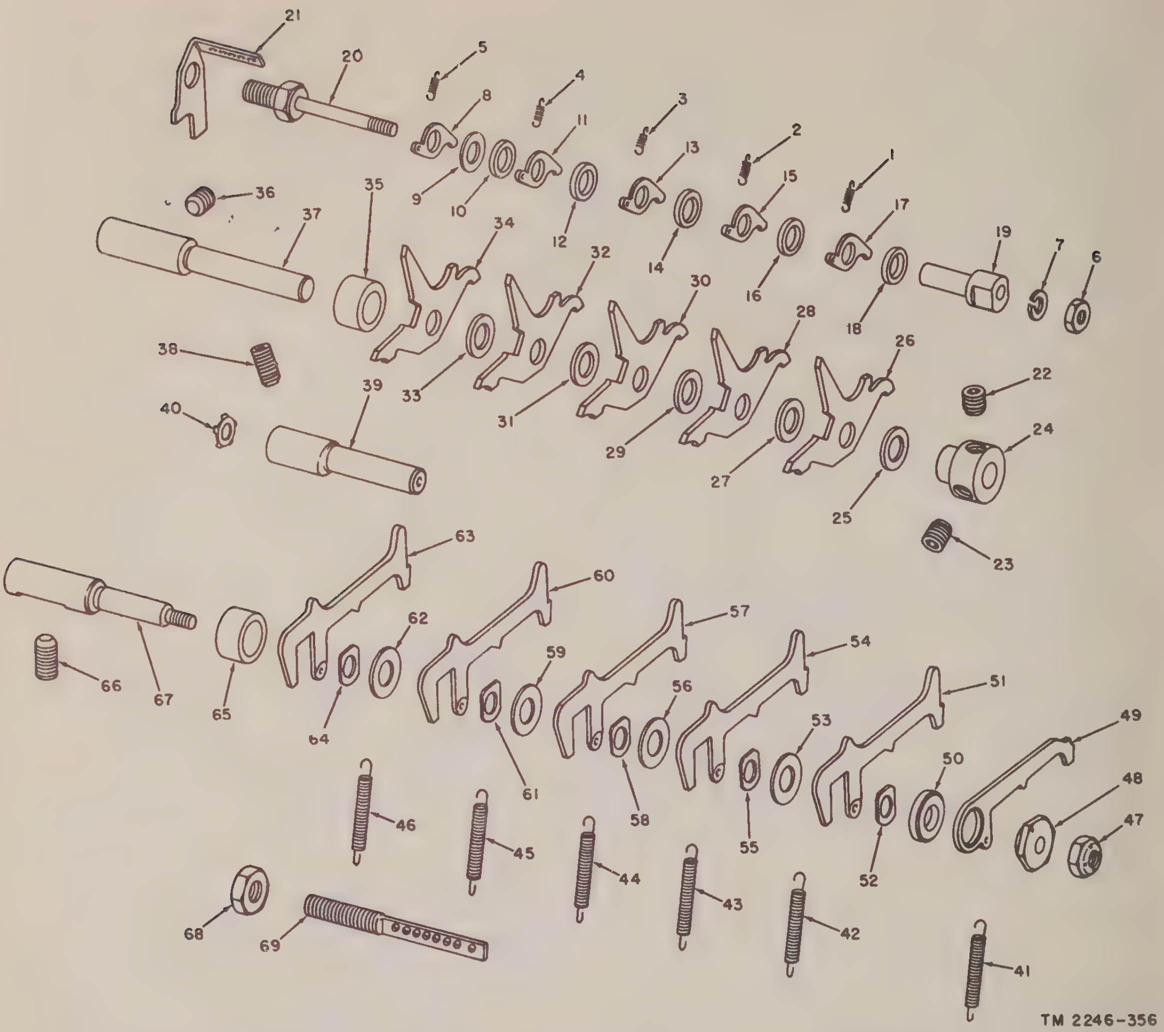
(14) Adjust the selector levers and selector Y-levers as described in paragraphs 296 through 426.

266. Removal and Replacement of Sequential Transfer Lever Shaft

(fig. 277)

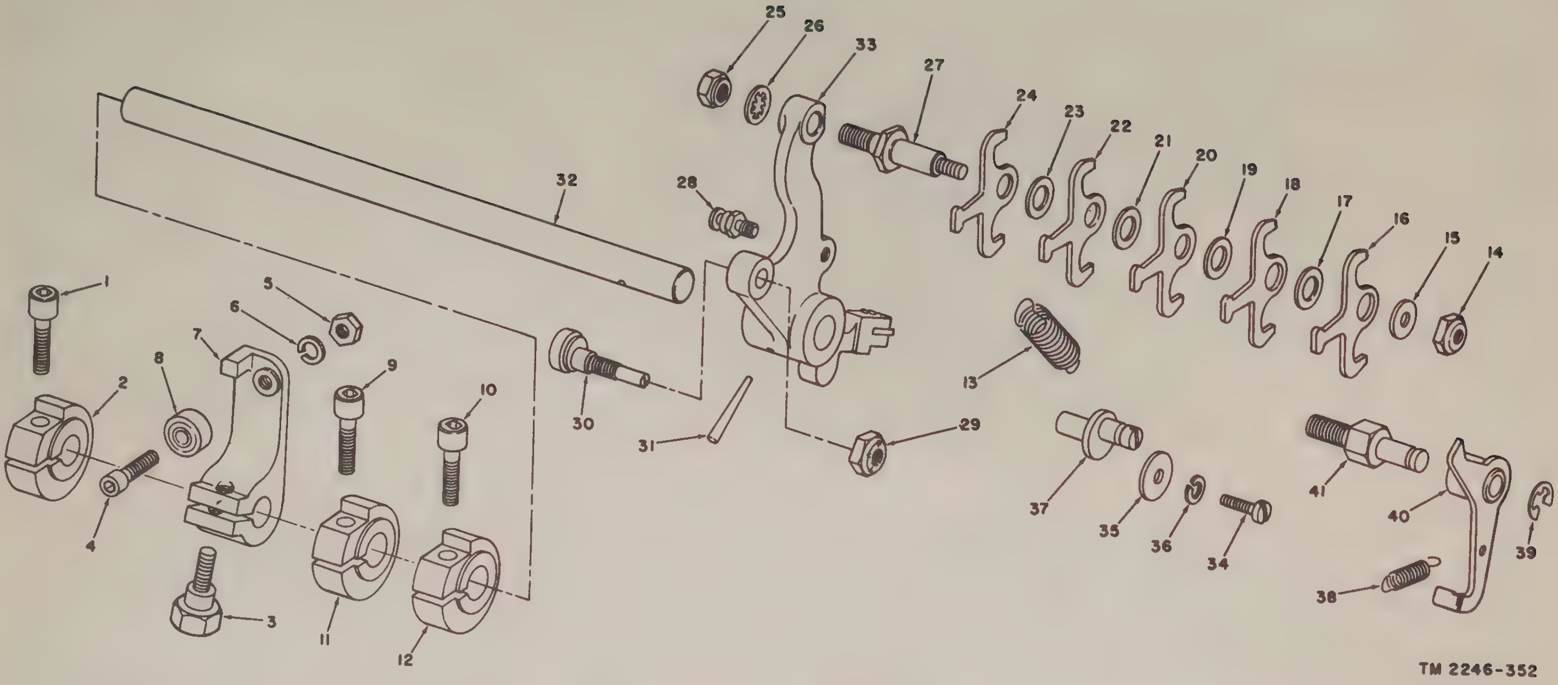
a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.



1 Y-lever detent spring, 55009
2 Y-lever detent spring, 55009
3 Y-lever detent spring 55009
4 Y-lever detent spring, 55009
5 Y-lever detent spring, 55009
6 Plain hexagonal nut, 10504
7 Lockwasher, 10434
8 Y-lever detent, 55004
9 Spacer, 55076
10 Detent spacer, 55001
11 Y-lever detent, 55004
12 Detent spacer, 55001
13 Y-lever detent, 55004
14 Detent spacer, 55001
15 Y-lever detent, 55004
16 Detent spacer, 55001
17 Y-lever detent, 55004
18 Detent spacer, 55001
19 Y-lever detent eccentric sleeve, 55007
20 Y-lever detent pivot, 55008
21 Y-lever detent spring bracket, 55002
22 Setscrew, 10209
23 Setscrew, 10209
24 Y-lever retaining collar, 55006
25 Flat washer, 50148
26 Selector Y-lever, 55003
27 Flat washer, 50148
28 Selector Y-lever, 55003
29 Flat washer, 50148
30 Selector Y-lever, 55003
31 Flat washer, 50148
32 Selector Y-lever, 55003
33 Flat washer, 50148
34 Selector Y-lever, 55003
35 Selector lever pivot post collar, 51416
36 Setscrew, 10210
37 Y-lever pivot post stud, 53269
38 Setscrew, 10211
39 Y-lever stop, 50152
40 Retainer ring, 10929
41 Selector lever spring, 50902
42 Selector lever spring, 50902
43 Selector lever spring, 50902
44 Selector lever spring, 50902
45 Selector lever spring, 50902
46 Selector lever spring, 50902
47 Self-locking hexagonal nut, 10500
48 Selector camshaft lever eccentric, 55024
49 Selector camshaft locking lever, 50014
50 Flat washer, 50053
51 Selector lever, 51068 (includes items 54, 57, 60 and 63)
52 Bearing, 51604 (includes items 55, 58, 61 and 64)
53 Flat washer, 50147
54 Selector lever
55 Bearing
56 Flat washer, 50147
57 Selector lever
58 Bearing
59 Flat washer, 50147
60 Selector lever
61 Bearing
62 Flat washer, 50147
63 Selector lever
64 Bearing
65 Selector lever pivot post collar, 51416
66 Setscrew, 10211
67 Selector lever pivot stud, 53268
68 Plain hexagonal nut, 10509
69 Selector lever spring post, 50325

Figure 276. Y-levers and selector levers, exploded view.



1	Machine screw, 10010
2	Shaft collar, 53973
3	Function clutch latch screw, 52176
4	Machine screw, 10000
5	Plain hexagonal nut, 10504
6	Lockwasher, 10434
7	Clutch latch arm, 50535
8	Ball bearing, 10754
9	Machine screw, 10010
10	Machine screw, 10010
11	Shaft coller, 53973
12	Shaft collar, 53973
13	Transfer lever spring, 55674
14	Self-locking hexagonal nut, 10500
15	Flat washer, 50414
16	Lever, 51066 (includes items 18, 20, 22, and 24)
17	Flat washer, 50148
18	T-lever
19	Flat washer, 50148
20	T-lever
21	Flat washer, 50148
22	T-lever
23	Flat washer, 50148
24	T-lever
25	Plain hexagonal nut, 50651
26	Lockwasher, 10404
27	T-lever pivot stud, 50650
28	Transfer lever spring post, 50649
29	Self locking hexagonal nut, 10501
30	Transfer lever roller stud, 56185
31	Taper pin, 10852
32	Transfer lever shaft, 54745A (includes items 31 and 33)
33	Transfer lever
34	Machine screw, 55511
35	Flat washer, 50839
36	Lockwasher, 10429
37	Transfer lever spring post eccentric, 56076
38	Transfer lever trip latch spring, 50904
39	Retainer ring, 10949
40	Transfer lever trip latch, 50020A
41	Transfer lever latch pivot stud, 52319

Figure 277. Sequential transfer lever shaft, exploded view.

(2) Remove the pulsing contact assembly from the perforator as described in paragraph 261*a*.

(3) Remove the machine screw (1), that holds the shaft collar (2) to the transfer lever shaft (32); remove the shaft collar.

(4) Remove the function clutch latch screw (3) that holds the clutch latch arm (7) to the transfer lever shaft (32); remove the clutch latch arm.

(5) Loosen the machine screws (9 and 10) from the shaft collars (11 and 12).

(6) Remove the transfer lever spring (13) from the transfer lever spring post (28) on the transfer lever (33) and from the spring post on the perforator frame.

(7) Remove the assembled transfer lever shaft, transfer lever (33) and T-levers by pulling them out of the front of the perforator, catching the shaft collars (11 and 12) as they fall from the transfer lever shaft (32).

b. Replacement.

(1) Insert the assembled transfer lever shaft (32), transfer lever (33), and T-levers in the bearing in the front frame of the perforator. Slide the two shaft collars (12 and 11) on the transfer lever shaft. Insert the transfer lever shaft (32) until it is properly seated in the bearings in the perforator frame.

(2) Install the transfer lever spring (13) on the transfer lever spring post (28) and on the spring post on the perforator frame.

(3) Tighten the machine screws (9 and 10) to secure the shaft collars (11 and 12) to the transfer lever shaft (32).

(4) Position the clutch latch arm (7) on the transfer lever shaft (32); secure with function clutch latch screw (3).

(5) Position the shaft collar (2) on the transfer lever shaft; secure with a machine screw (1).

(6) Install the pulsing contact assembly on the perforator as described in paragraph 261*b*.

(7) Install the perforator on the perforator base as described in paragraph 229*b*.

(8) Adjust the sequential transfer lever shaft as described in paragraphs 427, 428, 435, 436, 438, 439, and 440.

267. Disassembly and Reassembly of Sequential Transfer Lever Shaft

(fig. 277)

a. Disassembly.

(1) Remove the assembled sequential transfer lever shaft, transfer lever, and T-levers from the perforator as described in paragraph 266*a*.

(2) Remove the machine screw (4), plain hexagonal nut (5), and lockwasher (6) that hold the ball bearing (8) to the clutch latch arm (7); remove the ball bearing.

(3) Remove the self-locking hexagonal nut (14) and flat washer (15) that hold the T-levers (16, 18, 20, 22, and 24) to the T-lever pivot stud (27) on the transfer lever (33); alternately remove the T-levers and flat washers (17, 19, 21, and 23).

(4) Remove the plain hexagonal nut (25) and lockwasher (26) that hold the T-lever pivot stud (27) to the transfer lever (33); remove the T-lever pivot stud.

(5) Remove the transfer lever spring post (28) from the transfer lever (33).

(6) Tap out the taper pin (31) that holds the transfer lever (33) to the transfer lever shaft (32); remove the transfer lever shaft.

(7) Remove the machine screw (34), flat washer (35), and lockwasher (36) that hold the transfer lever spring post eccentric (37) to the perforator frame; remove the transfer lever spring post eccentric.

(8) Remove the transfer lever trip latch spring (38) from the transfer lever trip latch (40) from the spring post on the perforator frame.

(9) Remove the retainer ring (39) that holds the transfer lever trip latch (40) to the transfer lever latch pivot stud (41); remove the transfer lever trip latch. Remove the transfer lever latch pivot stud from the perforator frame.

b. Reassembly.

Note. If any of the T-levers are damaged and need to be replaced, replace all five of the T levers. These levers are supplied in matched sets, and will not function properly when operated in unmatched sets.

(1) Install the transfer lever latch pivot stud (41) in the perforator frame. Position the transfer lever trip latch (40) on the

transfer lever latch pivot stud; secure with a retainer ring (39).

(2) Install the transfer lever trip latch spring (38) on the transfer lever trip latch (40) and on the spring post on the perforator frame.

(3) Position the transfer lever spring post eccentric (37) on the perforator frame; secure with a machine screw (34), lockwasher (36), and flat washer (35).

(4) Position the transfer lever (33) on the transfer lever shaft (32); secure with a taper pin (31).

(5) Install the transfer lever spring post (28) on the transfer lever (33).

(6) Position the pivot stud (27) on the transfer lever (33); secure with a plain hexagonal nut (25) and lockwasher (26).

(7) Install the T-levers (24, 22, 20, 18, and 16) and flat washers (23, 21, 19, and 17) on the T-lever pivot stud (27), starting with a T-lever and alternating with a flat washer until all are installed. Secure the T-levers to the pivot stud with a flat washer (15) and self-locking hexagonal nut (14).

(8) Position the ball bearing (8) on the clutch latch arm (7); secure with a machine screw (4), plain hexagonal nut (5), and lockwasher (6).

(9) Install the sequential transfer lever shaft on the perforator as described in paragraph 266*b*.

(10) Adjust the transfer lever and T-levers as described in paragraphs 427, 428, 435, 436, 438, 439, and 440.

268. Disassembly and Reassembly of Perforator Selector Camshaft

(fig. 230)

a. Disassembly.

(1) Remove the rangefinder as described in paragraph 243*a*.

(2) Remove the two machine screws (1) and lockwashers (2) that hold the selector camshaft to the perforator frame.

(3) Remove the two setscrews (3) that hold the friction clutch disk (6) to the selector camshaft (16).

(4) Remove the machine screw (4) that holds the friction clutch adjusting collar (13) to the drive shaft collar (12); turn the friction clutch adjusting collar off the drive shaft collar.

(5) Remove the two setscrews (5) that hold the drive shaft collar (12) to the selector camshaft (16). Remove the selector camshaft by pulling it forward, free of the perforator frame, catching the friction clutch disk (6), friction plate (7), driving disk (8), friction plate (9), friction clutch plate (10), friction clutch spring (11), drive shaft collar (12), and friction clutch adjusting collar as they fall from the selector camshaft.

(6) Remove the retainer (14) that holds the ball bearing (15) to the selector camshaft (16); remove the ball bearing.

b. Reassembly.

(1) Position the ball bearing (15) on the selector camshaft (16); secure with a retainer ring (14).

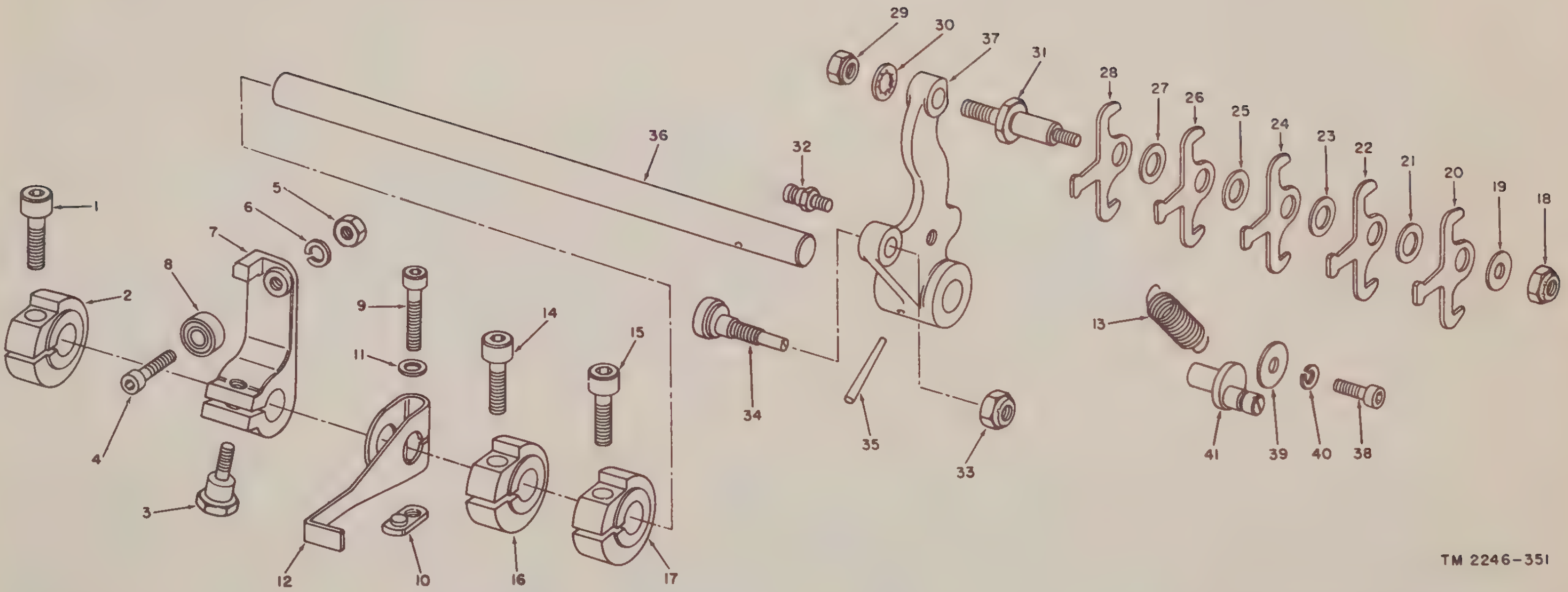
(2) Insert the selector camshaft (16) part of the way into the bearing seat opening in the perforator frame. Position the friction clutch adjusting collar (13), drive shaft collar (12), friction clutch spring (11), friction clutch plate (10), friction plate (9), driving disk (8), friction plate (7), and friction clutch disk (6) on the selector camshaft. Position the selector camshaft on the perforator so that end of the shaft is inserted into the ball bearing on the clutch yoke on the main shaft and the driving disk engages the clutch yoke.

(3) Position the drive shaft collar (12) on the selector camshaft (16) so that the tapped holes in the collar line up with the flats on the shaft (16); secure with two setscrews (5). Turn the friction clutch adjusting collar (13) on the drive shaft collar (12); secure with a machine screw (4).

(4) Position the friction clutch disk (6) on the selector camshaft (16) so that the tapped holes in the friction clutch disk line up with the flats on the selector camshaft; secure with two setscrews (3).

(5) Position the selector camshaft mounting bracket on the perforator frame; secure with two machine screws (1) and lockwashers (2).

(6) Install the rangefinder as described in paragraph 243*b*.



1 Machine screw, 10010
2 Shaft collar, 53973
3 Function clutch latch screw, 52176
4 Machine screw, 10000
5 Plan hexagonal nut, 10504
6 Lockwasher, 10434
7 Clutch latch arm, 50535
8 Ball bearing, 10754
9 Machine screw, 10041
10 Nut plate, 50174
11 Flat washer, 10459
12 Clutch release lever, 56032
13 Transfer lever spring, 50903
14 Machine screw, 10010
15 Machine screw, 10010
16 Shaft collar, 53973
17 Shaft collar, 53973
18 Self-locking hexagonal nut, 10500
19 Flat washer, 50414
20 T-lever, 51066 (includes items 22, 24, 26, and 28)
21 Flat washer, 50148
22 T-lever
23 Flat washer, 50148
24 T-lever
25 Flat washer, 50148
26 T-lever
27 Flat washer, 50148
28 T-lever
29 Plain hexagonal nut, 50651
30 Lockwasher, 10404
31 T-lever pivot stud, 50650
32 Transfer lever spring post, 50649
33 Self-locking hexagonal nut, 10501
34 Transfer lever roller stud, 56185
35 Taper pin
36 Transfer lever shaft, 54740A (includes items 35 and 37)
37 Transfer lever
38 Machine screw, 10003
39 Flat washer, 50839
40 Lockwasher, 10429
41 Transfer lever spring post eccentric, 56076

Figure 278. Simultaneous transfer lever shaft, exploded view.

(7) Adjust the selector camshaft friction clutch as described in paragraph 329.

269. Removal and Replacement of Simultaneous Transfer Lever Shaft

(fig. 278)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the pulsing contact assembly from the perforator as described in paragraph 261*a*.

(3) Remove the machine screw (1) that holds the shaft collar (2) to the transfer lever shaft (36); remove the shaft collar.

(4) Remove the function clutch latch screw (3) that holds the clutch latch arm (7) to the transfer lever shaft (36); remove the clutch latch arm.

(5) Remove the machine screw (9), nut plate (10), and flat washer (11) that hold the clutch release lever (12) to the transfer lever shaft (36); remove the clutch release lever.

(6) Loosen the two machine screws (14) and (15) that hold the shaft collars (16 and 17) to the transfer lever shaft (36).

(7) Remove the transfer lever spring (13) from the transfer lever spring post (32) on the transfer lever (37) and from the transfer lever spring post eccentric (41).

(8) Remove the assembled transfer lever shaft (36), transfer lever (37), and T-levers by sliding them out of the bearings toward the front of the perforator, catching the shaft collars (16 and 17) as they fall from the shaft.

b. Replacement.

(1) Insert the assembled transfer lever shaft (36), transfer lever (37), and T-levers into the front frame bearing of the perforator. Install the two shaft collars (16 and 17) on the end of the shaft and slide the transfer lever shaft into position on the perforator.

(2) Install the transfer lever spring (13) on the transfer lever spring post (32) on the transfer lever (37) and on the transfer lever spring post eccentric (41) on the perforator frame.

(3) Tighten the machine screws (14 and 15) to secure the shaft collars (16 and 17) to the transfer lever shaft.

(4) Position the clutch release lever (12) on the transfer lever shaft (36); secure with a machine screw (9), flat washer (11), and nut plate (10).

(5) Position the clutch latch arm (7) on the transfer lever shaft (36); secure with the function clutch latch screw (3).

(6) Position the shaft collar (2) on the transfer lever shaft (36); secure with a machine screw (1).

(7) Install the pulsing contact assembly on the perforator as described in paragraph 261*b*.

(8) Install the perforator on the perforator base as described in paragraph 229*b*.

(9) Adjust the transfer lever shaft as described in paragraphs 446, 447, 450, 454, 461, 462, 463, and 492.

270. Disassembly and Reassembly of Simultaneous Transfer Lever Shaft

(fig. 278)

a. Disassembly.

(1) Remove the simultaneous transfer lever shaft from the perforator as described in paragraph 269*a*.

(2) Remove the machine screw (4), plain hexagonal nut (5), and lockwasher (6) that hold the ball bearing (8) to the clutch latch arm (7); remove the ball bearing.

(3) Remove the self-locking hexagonal nut (18) and flat washer (19) that hold the T-levers (20, 22, 24, 26, and 28) to the T-lever pivot stud (31) on the transfer lever (37); remove the T-levers and flat washers (21, 23, 25, and 27) alternately.

(4) Remove the plain hexagonal nut (29) and lockwasher (30) that hold the T-lever pivot stud (31) to the transfer lever (37); remove the T-lever pivot stud.

(5) Remove the transfer lever spring post (32) from the transfer lever (37).

(6) Remove the self-locking hexagonal nut (33) that holds the transfer lever roller stud (34) to the transfer lever (37); remove the transfer lever roller stud.

(7) Remove the taper pin (35) that holds the transfer lever (37) to the transfer lever shaft (36); remove the transfer lever.

(8) Remove the machine screw (38), flat washer (39), and lockwasher (40) that hold the transfer lever spring post eccen-

tric (41) to the perforator frame; remove the transfer lever spring post eccentric.

b. Reassembly.

Note. If any of the T-levers are damaged and need to be replaced, replace all five of the T-levers. These levers are supplied in matched sets, and will not function properly when operated in unmatched sets.

(1) Position the transfer lever spring post eccentric (41) on the perforator frame; secure with a machine screw (38), lockwasher (40), and flat washer (39).

(2) Position the transfer lever (37) on the transfer lever shaft (36); secure with a taper pin (35).

(3) Position the transfer lever roller stud (34) on the transfer lever (37); secure with a self-locking hexagonal nut (33).

(4) Install the transfer lever spring post (32) on the transfer lever (37).

(5) Position the T-lever pivot stud (31) on the transfer lever (37); secure with a plain hexagonal nut (29) and lockwasher (30).

(6) Install the five T-levers (28, 26, 24, 22, and 20) and the four flat washers (27, 25, 23, and 21) on the T-lever pivot stud (31), starting with a transfer lever and alternating a flat washer until all are installed. Secure the T-levers to the T-lever pivot stud (31) with a flat washer (19) and self-locking hexagonal nut (18).

(7) Position the ball bearing (8) on the clutch latch arm (7); secure with a machine screw (4), lockwasher (6), and plain hexagonal nut (5).

(8) Install the simultaneous transfer lever shaft on the perforator as described in paragraph 269*b*.

(9) Adjust the transfer lever as instructed in paragraph 269*b*.

271. Disassembly and Reassembly of Main Shaft

(fig. 279)

a. Disassembly.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the motor from the perforator as described in paragraph 240*a*.

(3) Remove the selector camshaft as described in paragraph 268*a*.

(4) Remove the machine screw (1) and lockwasher (2) that hold the worm gear (3) to the main shaft (18); remove the worm gear and five gear keys (4).

(5) Remove the four machine screws (5), four lockwashers (6), and two flat washers (7) that hold the bearing plate (8) and the ball bearing (9) to the gear case; remove the ball bearing and flat washer (10).

(6) Tilt the perforator chassis, allowing it to rest on the right side. Remove the two machine screws and lockwashers that hold the bearing cap to the motor support frame; remove the bearing cap.

(7) Remove the assembled main shaft, power shaft gear (16) and ball bearing (17) from the perforator.

(8) Remove the two machine screws (11) and lockwashers (12) that hold the friction clutch drive assembly (13) to the gear on the main shaft (18); remove the friction clutch drive assembly and ball bearing (14).

(9) Tap out the taper pin (15) that holds the power shaft gear (16) to the main shaft (18); remove the power shaft gear and ball bearing (17).

b. Reassembly.

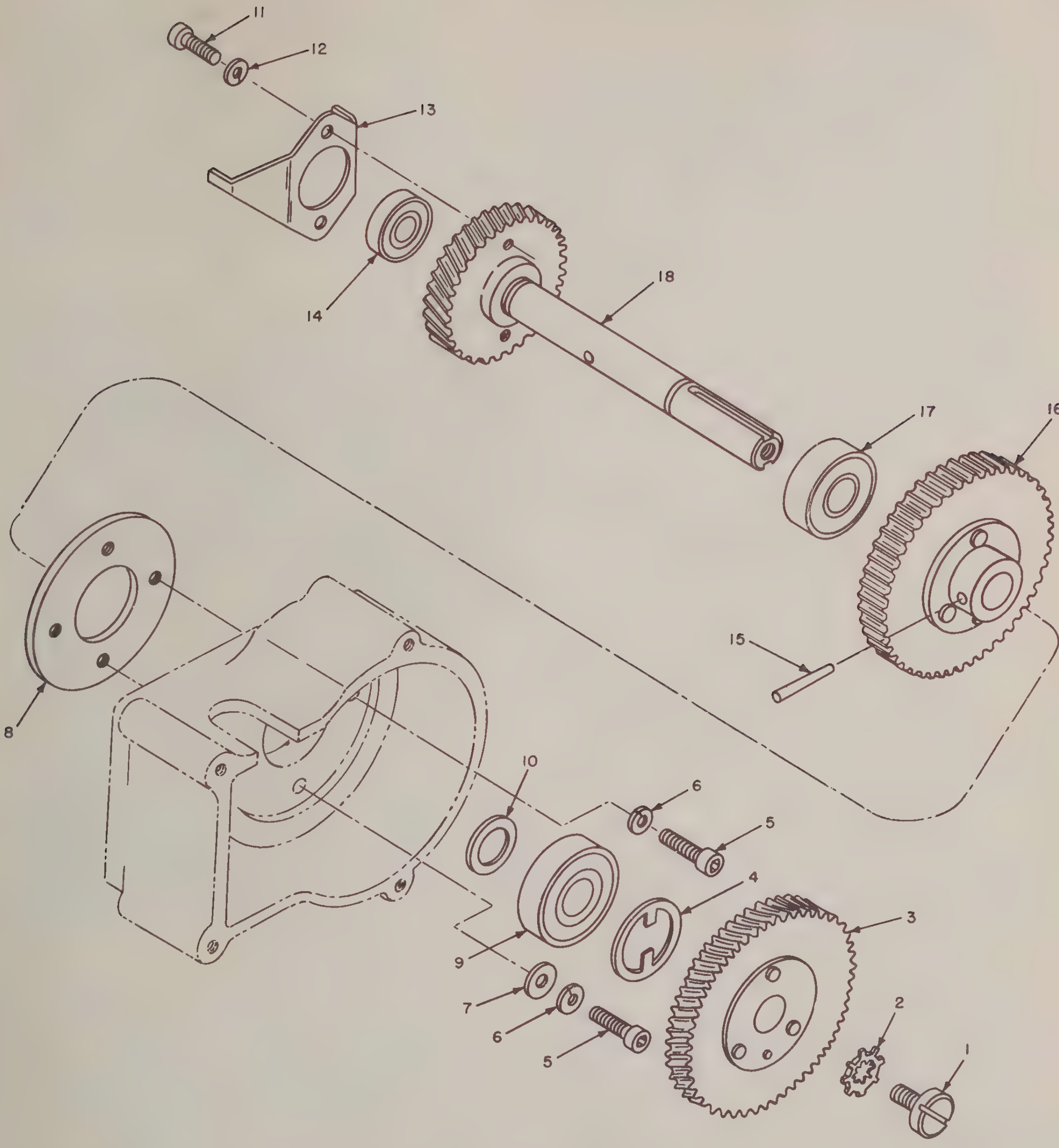
(1) Position the ball bearing (17) and the power shaft gear (16) on the main shaft (18); secure the power shaft gear with a taper pin (15).

(2) Position the ball bearing (14) in the bearing seat on the gear end of the main shaft (18); position the friction clutch drive assembly (13) on the main shaft; secure with two machine screws (11) and lockwashers (12). Stake the friction clutch drive assembly over the bearing.

(3) Position the bearing plate (8) on the main shaft (18). Insert the rear end of the main shaft in the bearing seat opening in the gear case and position the flat wash (10) and ball bearing (9) on the end of the main shaft.

(4) Position the bearing cap on the ball bearing (17) and secure to the motor support frame with two machine screws and lockwashers.

(5) Position the ball bearing (9) well into the bearing seat of the gear case and position the bearing plate (8) on the gear case; secure both with four machine screws (5), four lockwashers (6), and two flat washers (7).



TM 2246-255

1 Machine screw, 50207
2 Lockwasher, 10406
3 Worm gear (60 wpm), 50352
4 Machine key, 54566
5 Machine screw, 10005
6 Lockwasher, 10429
7 Flat washer, 10450
8 Bearing plate, 54743
9 Ball bearing, 10758
10 Flat washer, 50746
11 Machine screw, 10004
12 Lockwasher, 10429
13 Friction clutch drive assembly, 54732
14 Ball bearing, 10753
15 Taper pin, 10852
16 Power shaft gear, 54731
17 Ball bearing, 10763
18 Main shaft, 54734

Figure 279. Perforator main shaft, exploded view.

(6) Position five gear keys (4) and worm gear (3) on the main shaft (18); secure with a machine screw (1) and lockwasher (2).

Note. Make sure the worm gear installed on the main shaft is correct for the operating speed desited (par. 29). Check that the worm gear is marked for the same speed as the mating worm gear on the motor armature shaft.

(7) Install the selector camshaft as instructed in paragraph 268*b*.

(8) Install the motor on the perforator as instructed in paragraph 240*b*.

(9) Install the perforator on the perforator base as described in paragraph 229*b*.

272. Disassembly and Reassembly of Code Actuated Switch Function Shaft

a. Disassembly.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the pulsing contact assembly as described in paragraph 261*a*.

(3) Remove the sequential transfer lever shaft as described in paragraph 266*a*.

(4) Remove the setscrew (1, fig. 280) and the mounting clutch setscrew (2) that hold the clutch coupling (3) to the code actuated switch function shaft (23); remove the clutch coupling. Remove the clutch spring (4) and the sliding drum clutch (5) from the code actuated switch function shaft.

(5) Remove the retainer ring (6) that holds the function camshaft gear (13) to the code actuated switch function shaft (23); remove the two flat washers (7 and 8) and the assembled ball bearings (9 and 11) and function camshaft gear.

(6) Remove the two ball bearings (9 and 11) and retainer rings (10 and 12) from the function camshaft gear (13).

(7) Remove the retainer ring (14) from the code actuated switch function shaft (23).

(8) Remove the two setscrews (15) that hold the transfer lever cam (16) to the code actuated switch function shaft (23); remove the transfer lever cam (16).

(9) Remove the two machine screws (47, fig. 258), flat washers (48), and lockwashers (49) that hold the ball bearing (17, fig. 280) to the bearing seat in the perforator frame; remove the ball bearing and flat washer (18).

(10) Remove the two set screws (19) and mounting seats (20) that hold the code actuated switch cam (21) to the code actuated switch function shaft (23); remove the assembled function shaft and ball bearing (22) by pulling the function shaft to the front; catch the code actuated switch cam as it falls from the shaft. Remove the ball bearing (22) from the shaft.

b. Reassembly.

(1) Position the ball bearing (22, fig. 280) on the code actuated switch function shaft (23). Insert the function shaft part of the way into the bearing seat hole in the front casting of the perforator. Slide the code actuated switch cam (21) on the shaft and position the shaft on the perforator so that the bearing (22) is properly positioned in the bearing seat. Secure the code actuated switch cam to the function shaft with two mounting seats (20) and setscrews (19).

(2) Position the flat washer (18) and ball bearing (17) on the code actuated switch function shaft (23) so that the ball bearing is properly seated in the bearing seat on the front perforator casting; secure with two machine screws (47, fig. 258), lockwashers (49), and flat washers (48).

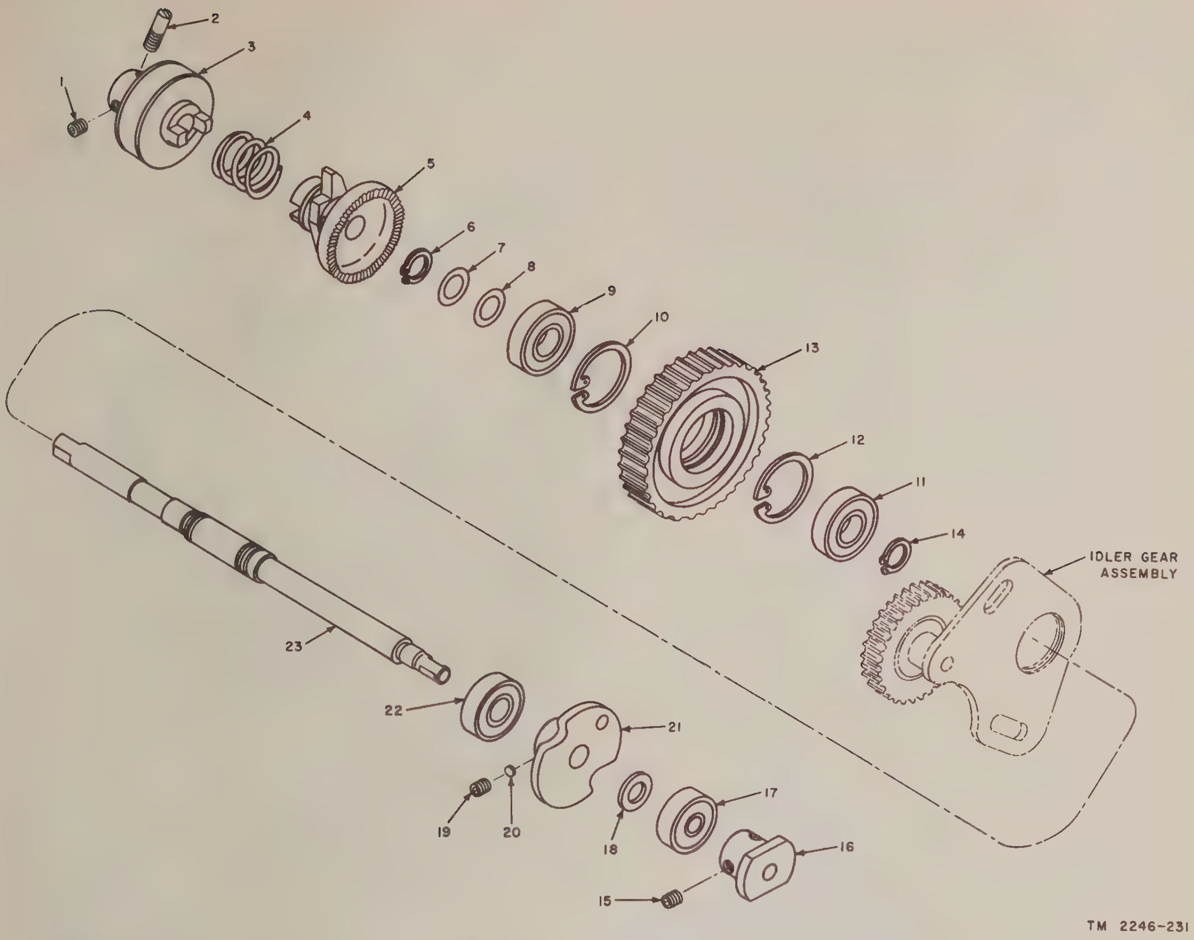
(3) Position the transfer lever cam (16, fig. 280) on the code actuated switch function shaft (23); secure with two setscrews (15). Make sure that the holes in the cam are alined with the two flats on the function shaft.

(4) Install the retainer ring (14) on the code actuated switch function shaft (23).

(5) Install the two retainer rings (10 and 12) in the function camshaft gear (13). Install the two ball bearings (9 and 11) on the function camshaft gear (13).

(6) Install the assembled function camshaft gear (13) and ball bearings on the code actuated switch function shaft (23); secure with two flat washers (8 and 7) and a retainer ring (6).

(7) Position the sliding drum clutch (5), clutch spring (4), and clutch coupling (3) on the code actuated switch function



1	Setscrew, 10209
2	Mounting clutch setscrew, 56011
3	Clutch coupling, 51176A
4	Clutch spring, 50848
5	Sliding drum clutch, 50516
6	Retainer ring, 10965
7	Flat washer, 55034
8	Flat washer, 55034
9	Ball bearing, 10763
10	Retainer ring, 11038
11	Ball bearing, 10763
12	Retainer ring, 11038
13	Function camshaft gear, 56061
14	Retainer ring, 10965
15	Setscrew, 10209
16	Transfer lever cam, 50563
17	Ball bearing, 10756
18	Flat washer, 52283
19	Setscrew, 10209
20	Mounting seat, 52159
21	Code actuated switch cam 55608
22	Ball bearing, 10757
23	Code actuated switch function shaft, 54729

Figure 280. Code actuated switch function shaft, exploded view.

shaft (23); secure with a mounting clutch setscrew (2) and setscrew (1).

(8) Install the sequential transfer lever shaft on the perforator as described in paragraph 266*b*.

(9) Install the pulsing contact assembly as described in paragraph 261*b*.

(10) Adjust the code actuated switch function shaft as described in paragraphs 435, 436, 437, 438, 439, and 440.

(11) Install the perforator on the base as described in paragraph 229*b*.

273. Disassembly and Reassembly of Idler Gear Bracket

(fig. 281)

Note. The following procedures apply when the equipment is being operated at 60 wpm or at 75 wpm with the 75–100 wpm gear on the receiving multisolenoid function shaft. For speeds of 100 wpm with the 75–100 gear on the receiving multisolenoid function shaft, or 75 wpm with the 60–75 wpm gear on the receiving multisolenoid function shaft, the positions of idler gear 56172A and spacer 56074 are interchanged, see paragraph 29.

a. Disassembly.

(1) Remove the perforator from the perfora-

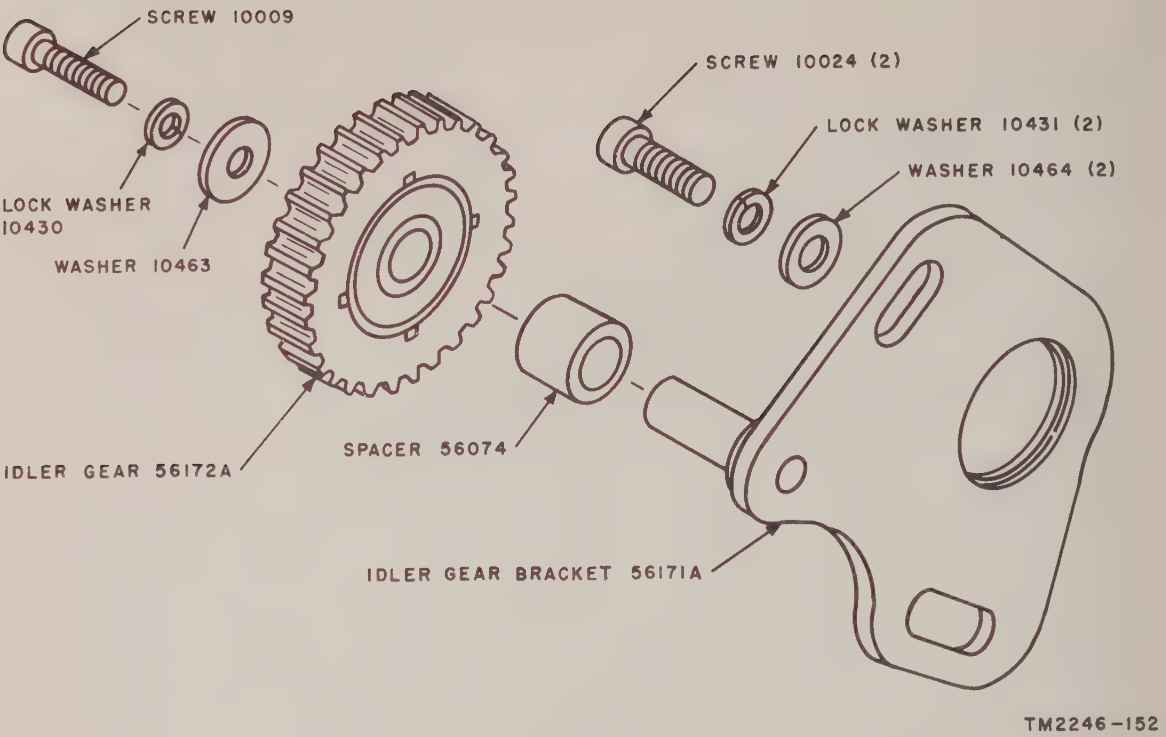


Figure 281. Idler gear bracket, exploded view.

tor base as described in paragraph 229*a*.

(2) Remove the pulsing contact assembly as described in paragraph 261*a*.

(3) Disassemble the code actuated switch function shaft as described in paragraph 272*a*(4) through (7).

(4) Remove screw 10009, flat washer 10463, and lockwasher 10430 that hold idler gear 56172A to idler gear bracket 56171A; remove idler gear 56172A and spacer 56074.

(5) Remove two screws 10024, flat washers 10464, and lockwashers 10431 that hold idler gear bracket 56171A to the preforator frame; remove idler gear bracket 56171A.

b. Reassembly.

(1) Position the idler gear bracket 56171A on the perforator frame; secure with two screws 10024, lockwashers 10431, and flat washers 10464.

(2) Position spacer 56074 and idler gear 56172A on the idler gear bracket 56171A: secure with screw 10009, lockwasher 10430, and flat washer 10463.

(3) Reassemble the code actuated switch function shaft as described in paragraph 272*a* (4) through (7).

(4) Install the pulsing contact assembly as described in paragraph 261*b*.

(5) Install the perforator on the perforator base as described in paragraph 229*b*.

274. Removal and Replacement of Receiving Multisolenoid Function Shaft

(fig. 282)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the pulsing contact assembly from the perforator as described in paragraph 261*a*.

(3) Remove the ribbon supply group as described in paragraph 253*a*.

(4) Loosen the two screws that hold the idler gear bracket to the perforator frame; pivot the idler gear out of engagement with the gear (15).

(5) Remove the two machine screws (1) and lockwashers (2) that hold the bearing block (22) to the front support frame.

(6) Remove the two machine screws (3) and lockwashers (4) that hold the bearing cap to the perforator frame; remove the assembled bearing cap and code ring cage assembly.

(7) Remove the two machine screws (5) and lockwashers (6) that hold the bearing cap to the rear perforator frame; remove the bearing cap.

(8) Lift the back end of the receiving multisolenoid function shaft slightly and shift the function shaft to the rear far enough so that the print and register cam (20) clears the cam roller on the punch arm assembly; remove the receiving multisolenoid function shaft from the perforator.

b. Replacement.

(1) Position the receiving multisolenoid function shaft on the perforator so that the print and register cam (20) engages the cam roller on the punch arm assembly and the bearings properly seat on the perforator frame.

(2) Position the bearing cap on the rear perforator frame; secure with two machine screws (5) and lockwashers (6).

(3) Position the assembled code ring cage and bearing cap on the front perforator frame; secure with two machine screws (3) and lockwashers (4).

(4) Position the bearing clock (22) on the front support frame; secure with two machine screws (1 and 2).

(5) Pivot the idler gear bracket so that the idler gear meshes with the gear (15) on the receiving multisolenoid function shaft; tighten the two screws that secure the idler gear bracket to the perforator frame.

(6) Install the ribbon supply group as described in paragraph 253*b*.

(7) Install the pulsing contact assembly as described in paragraph 261*b*.

(8) Install the perforator on the perforator base as described in paragraph 229*b*.

(9) Adjust the receiving multisolenoid function shaft as described in paragraphs 455, 456, 457, 458 and 469.

275. Disassembly and Reassembly of Receiving Multisolenoid Function Shaft

(fig. 282)

a. Disassembly.

(1) Remove the receiving multisolenoid function shaft as described in paragraph 274*a*.

(2) Remove the mounting clutch setscrew (7) and setscrew (8) that holds the sliding clutch coupling (9) to the receiving multisolenoid function shaft (38); remove the sliding clutch coupling, sliding clutch spring (10), and sliding drum clutch (11).

(3) Remove the retainer ring (12) that holds the gear (15) to the receiving multisolenoid function shaft (38); remove the two flat washers (13 and 14), gear (15), and flat washer (16).

(4) Remove the retainer ring (17) that holds the ball bearing (18) to the receiving multisolenoid function shaft (38); remove the ball bearing.

(5) Remove the two setscrews (19) that hold the print and register cam (20) to the receiving multisolenoid function shaft (38); remove the print and register cam, ball bearing (21), and bearing block (22).

(6) Remove the two setscrews (23) that hold the transfer lever cam (24) to the receiving multisolenoid function shaft (38); remove the transfer lever cam, ball bearing (25), and flat washer (26).

(7) Remove the two setscrews (27) that hold the type wheel and function lever cam (28) to the receiving multisolenoid function shaft (38); remove the type wheel and function lever cam, felt plate (29), friction shaft drive gear (30), felt plate (31), keyed clutch disk (32), and friction clutch spring (33).

(8) Remove the machine screw (34) that holds the friction adjusting collar (35) to the keyed collar (37); turn the friction adjusting collar off the keyed collar.

(9) Remove the two setscrews (36) that hold the keyed collar (37) to the receiving multisolenoid function shaft; remove the keyed collar.

b. Reassembly.

(1) Position the keyed collar (37) on the receiving multisolenoid function shaft

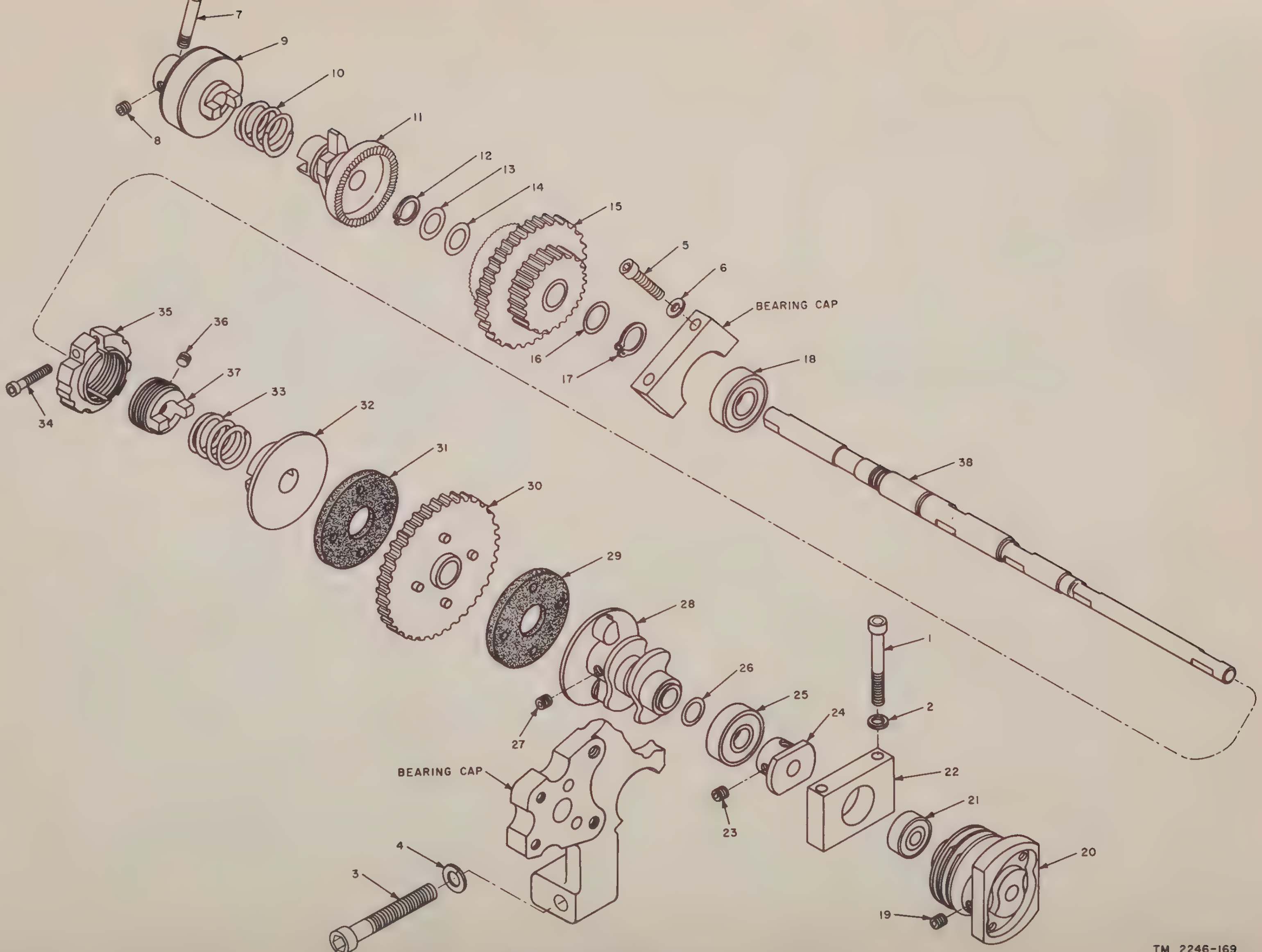


Figure 282. Receiving multisolenoid function shaft, exploded view.

1	Machine screw, 10063
2	Lockwasher, 10403
3	Machine screw, 10038
4	Lockwasher, 10427
5	Machine screw, 10012
6	Lockwasher, 10430
7	Mounting clutch setscrew, 56011
8	Setscrew, 10209
9	Sliding clutch coupling, 51167A
10	Sliding clutch spring, 50848
11	Sliding drum clutch, 50516
12	Retainer ring, 10956
13	Flat washer, 55034 (as rqr)
14	Flat washer, 55035 (as rqr)
15	Gear (60-75 wpm), 56128A Gear (75–100 wpm), 56105A
16	Flat washer, 55034
17	Retainer ring, 10965
18	Ball bearing, 10763
19	Setscrew, 10209
20	Print and register cam, 52456A
21	Ball bearing, 10753
22	Bearing block, 55131
23	Setscrew, 10209
24	Transfer lever cam, 50536
25	Ball bearing, 10756
26	Flat washer, 52283
27	Setscrew, 10209
28	Type wheel and function lever cam, 52389A
29	Felt plate, 56273
30	Friction shaft drive gear, 56330A
31	Felt plate, 56273
32	Keyed clutch disk, 56248
33	Friction clutch spring, 56249
34	Machine screw, 10006
35	Friction adjusting collar, 56247
36	Setscrew, 10208
37	Keyed collar, 56246
38	Receiving multisolenoid function shaft, 54727

Figure 282—Continued.

(38); secure with two setscrews (36), making sure the two tapped holes in the keyed collar are alined with the two flats on the receiving multisolenoid function shaft.

(2) Turn the friction adjusting collar (35) on the keyed collar (37); secure with a machine screw (34).

(3) Install the friction clutch spring (33), keyed clutch disk (32), felt plate (31), friction shaft drive gear (30), felt plate (29), and type wheel and function lever cam (28) on the receiving multisolenoid function shaft (38); secure the type wheel and function lever cam to the receiving multisolenoid function shaft with two setscrews (27).

(4) Position the flat washer (26), ball bearing (25), and transfer lever cam (24), on the receiving multisolenoid function shaft; secure the transfer lever cam to the receiving multisolenoid function shaft with two setscrews (23).

(5) Position the bearing block (22), ball bearing (21), and print and register cam (20) on the receiving multisolenoid function shaft; secure the print and register cam to the receiving multisolenoid function shaft with two setscrews (19).

(6) Position the ball bearing (18) on the receiving multisolenoid function shaft; secure with a retainer ring (17).

(7) Position the flat washer (16), gear (15), and two flat washers (14 and 13) on the receiving multisolenoid function shaft; secure with a retainer ring (12).

Note. Make sure the gear installed is correct for the operating speed desired (par. 29). Make sure the idler gear will mate with the correct gear surface of the double gear installed on the receiving multisolenoid function shaft as shown in the table in paragraph 29*e*.

(8) Position the sliding drum clutch (11), sliding clutch spring (10), and sliding clutch coupling (9) on the receiving multisolenoid function shaft; secure the sliding clutch coupling to the receiving multisolenoid function shaft with a setscrew (8) and a mounting clutch setscrew (7).

(9) Install the receiving multisolenoid function shaft on the perforator as described in paragraph 274*b*.

(10) Adjust the receiving multisolenoid function shaft as described in paragraphs 455, 456, 457, 458, and 469.

276. Disassembly and Reassembly of Transmitter-Distributor Drive Shaft

(fig. 283)

a. Disassembly.

(1) Remove the transmitter-distributor from the perforator as described in paragraph 230*a*.

(2) Remove the two setscrews (1) that hold the clutch disk (2) to the transmitter-distributor drive shaft (18); remove the clutch disk, felt plate (3), clutch driver (4), felt plate (5), keyed clutch disk (6), and friction clutch spring (7).

(3) Remove the machine screw (8) that holds the friction adjusting collar (9) to the keyed collar (11); turn the friction adjusting collar off the keyed collar.

(4) Remove the two setscrews (10) that hold the keyed collar (11) to the transmitter-distributor drive shaft (18); remove the keyed collar.

(5) Remove the two machine screws (12), flat washers (13), and lockwashers (14) that hold the ball bearing (19) to the perforator frame.

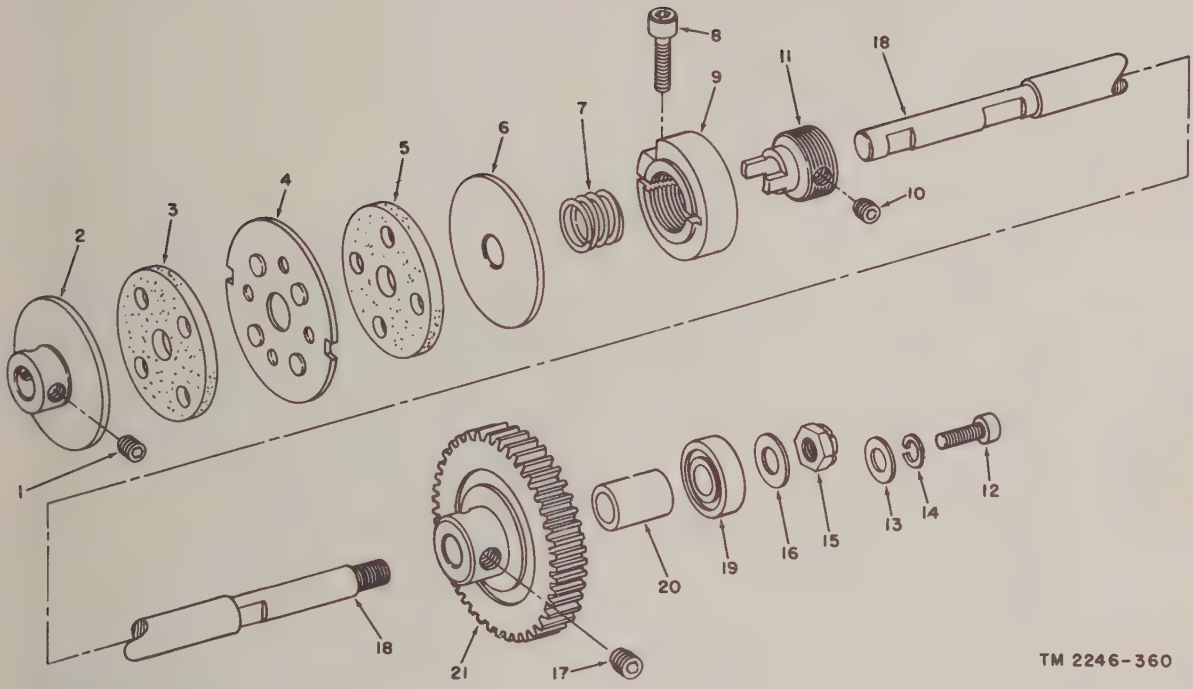
(6) Remove the self-locking hexagonal nut (15) and flat washer (16) that hold the ball bearing (19) to the transmitter-distributor drive shaft (18).

(7) Remove the two setscrews (17) that hold the driven gear (21) to the transmitter-distributor drive shaft (18); remove the transmitter-distributor drive shaft, releasing the ball bearing (19), shaft collar (20), and driven gear (21).

b. Reassembly.

(1) Position the transmitter-distributor drive shaft (18) on the perforator far enough to install the driven gear (21) and shaft collar (20) on the end of the transmitter-distributor drive shaft. Insert the transmitter-distributor drive shaft the remainder of the way and position the ball bearing (19) on the end of the transmitter-distributor drive shaft.

(2) Mesh the driven gear (21) with the gear on the main shaft and position the ball bearing (19) in the bearing seat on the perforator frame; secure the ball bearing



1 Setscrew, 10209
2 Clutch disk, 50200
3 Felt plate 50013
4 Clutch driver, 51117
5 Felt plate 50013
6 Keyed clutch disk, 54931
7 Friction clutch spring, 54934
8 Machine screw 10052
9 Friction adjusting collar, 54926
10 Setscrew, 10208
11 Keyed collar, 54928
12 Machine screw, 10004
13 Flat washer, 10450
14 Lockwasher, 10429
15 Self-locking hexagonal nut, 10525
16 Flat washer, 10455
17 Setscrew, 10209
18 Transmitter-distributor drive. shaft 56106
19 Ball bearing, 10753
20 Shaft collar, 56107
21 Driven gear, 52506

Figure 283. Transmitter-distributor drive shaft, exploded view.

to the transmitter-distributor drive shaft (18) with a flat washer (16) and a self-locking hexagonal nut (15).

(3) Secure the ball bearing to the perforator frame with two machine screws (12), lockwashers (14), and flat washers (13).

(4) Position the keyed collar (11) on the transmitter distributor drive shaft (18); secure with two setscrews (10), making sure that the tapped holes in the keyed collar are alined with the flats on the transmitter-distributor drive shaft.

(5) Turn the friction adjusting collar (9) on the keyed collar (11); secure with a machine screw (8).

(6) Position the friction clutch spring (7), keyed clutch disk (6), felt plate (5), clutch driver (4), felt plate (3), and clutch disk (2) on the transmitter-distributor drive shaft (18); secure the clutch disk to the transmitter-distributor shaft with two setscrews (1).

(7) Install the transmitter-distributor on the perforator as described in paragraph 230*b*.

(8) Adjust the transmitter-distributor friction clutch as described in paragraph 520.

277. Disassembly and Reassembly of Type Wheel Reciprocating Mechanism

(fig. 284)

a. Disassembly.

(1) Remove the code-ring locking bail cam follower spring (1) from the code-ring locking bail cam follower (6) and from the function plate (46).

(2) Remove the machine screw (2), anchor nut (3), flat washer (4), that hold the code-ring locking bail cam follower (6) to the code-ring locking bail shaft (12); remove the code-ring locking bail cam follower.

(3) Remove the machine screw (7), flat washer (8), and lockwasher (9) that hold the code-ring locking bail (10) to the code-ring locking bail shaft (12); remove the code-ring locking bail.

(4) Remove the four retaining rings (11) that hold the code-ring locking bail shaft (12) to the function plate (46) and to the letters figures shift latch (13). Disconnect the spring (33) from the letters figures-shift latch. Remove the code-ring locking bail shaft (12) and letters figures-shift latch.

(5) Remove the retainer ring (14) that holds the type wheel reciprocating transfer lever (15) to the type wheel reciprocating transfer lever eccentric stud (18); remove the type wheel reciprocating transfer lever.

(6) Remove the type wheel reciprocating transfer lever eccentric stud (18) from the function plate (46).

(7) Remove the type wheel reciprocating lever spring (19) from the spring pin (29) and from the type wheel reciprocating spring lever (26).

(8) Remove the two setscrews (20) that hold the shaft collar (21) to the type wheel shift lever stud (37); remove the shaft collar, and retainer plate (22).

(9) Remove the drive pin (23) and spring pin (29) from the type wheel reciprocating drive levers (24 and 30). Remove the type wheel reciprocating drive levers (24), flat washer (25), type wheel reciprocating spring lever (26), sleeve bearing (27), flat washer (28), type wheel reciprocating drive levers (30), and two flat washers (31 and 32).

(10) Remove the spring (33) from the figures-letters shift lever (34); remove the figures-letters shift lever and flat washer (35) from the type wheel shift lever stud (37).

(11) Remove the self-locking hexagonal nut (36) that holds the type wheel shift lever stud (37) to the function plate (46); remove the type wheel shift lever stud (37).

(12) Remove the bell sensing lever spring (38), shift cam follower spring (39), letters sensing levers spring (40), and figures sensing levers spring (41) from the function plate (46) and from the function sensing levers.

(13) Remove the two machine screws (42 and 44) and lockwashers (43 and 45) that hold the function plate (46) to the perforator frame; remove the function plate (46).

b. Reassembly.

(1) Position the function plate (46) on the perforator frame; secure with two machine screws (44 and 42) and lockwashers (45 and 43).

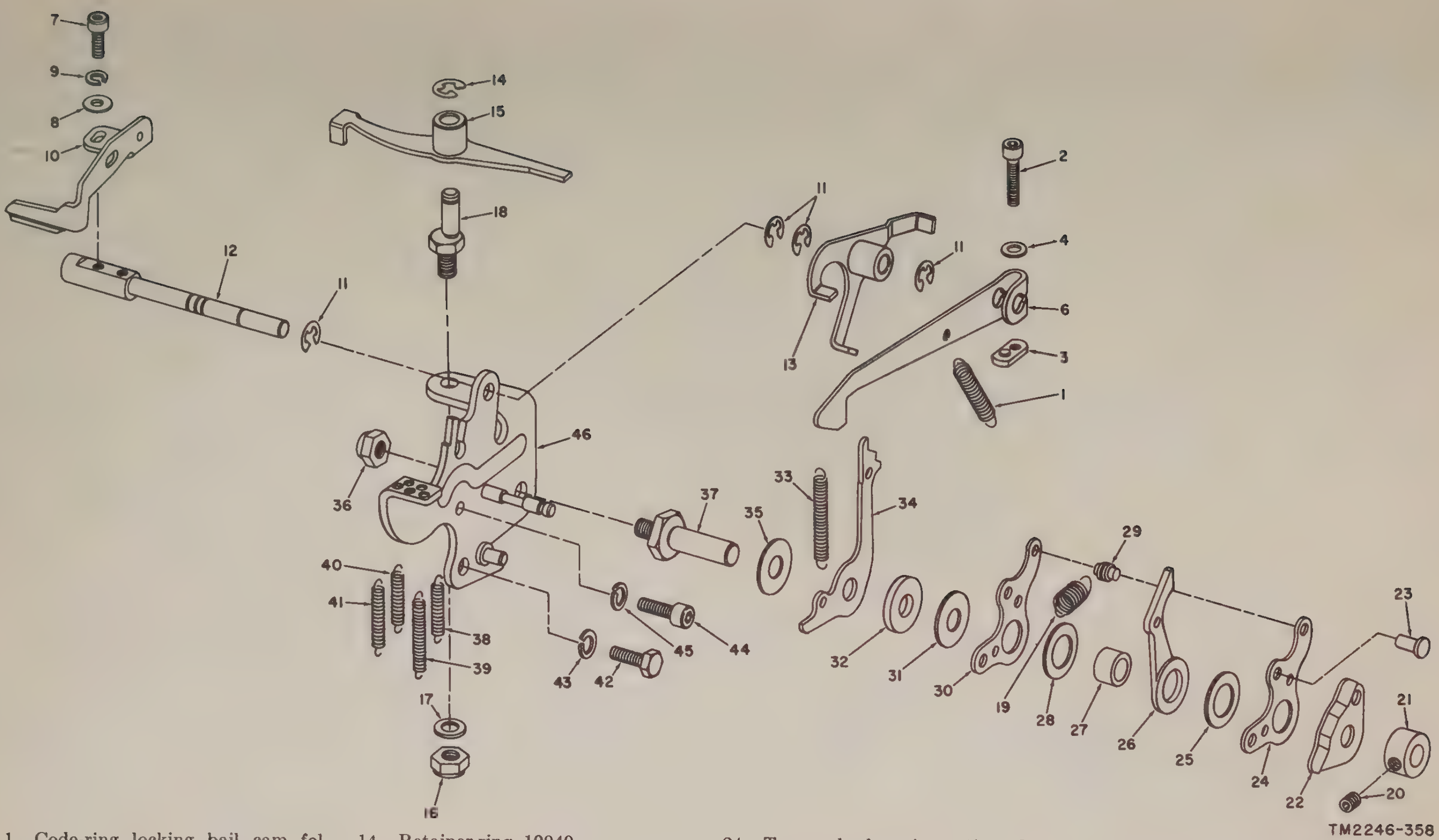
(2) Install the figures sensing levers spring (41), letters sensing levers spring (40), shift cam follower spring (39), and bell sensing lever spring (38) on the function plate (46) and on the function sensing levers.

(3) Position the type wheel shift lever stud (37) on the function plate (46); secure with a self-locking hexagonal nut (36).

(4) Position the flat washer (35) and figures-letters shift lever (34) on the type wheel shift lever stud (37); install the spring (33) on the figures-letters shift lever.

(5) Install the two flat washers (32 and 31), type wheel reciprocating drive lever (30), flat washer (28), sleeve bearing (27), type wheel reciprocating spring lever (26), and flat washer (25) on the type wheel shift lever stud (37).

(6) Position the spring pin (29) in the hole in the type wheel reciprocating drive lever (30) and install the type wheel reciprocating drive lever (24), engaging the other end of the spring pin in the hole in the type wheel reciprocating drive lever. Insert the drive pin (23) so that it



1	Code-ring locking bail cam follower spring, 53569
2	Machine screw, 10006
3	Anchor nut, 50174
4	Flat washer, 10459
6	Code-ring locking bail cam follower, 52657
7	Machine screw, 10004
8	Flat washer, 10458
9	Lockwasher, 10429
10	Code-ring locking bail, 52653
11	Retainer ring, 10949
12	Code-ring locking bail shaft, 52291
13	Letters figures shift latch lever, 52411
14	Retainer ring, 10949
15	Type wheel reciprocating transfer lever, 52478
16	Self-locking hexagonal nut, 10525
17	Flat washer, 52430
18	Type wheel reciprocating transfer lever eccentric stud, 52399
19	Type wheel reciprocating lever spring, 52167
20	Setscrew, 10209
21	Shaft collar, 50209
22	Retainer plate, 53652
23	Drive pin, 52404
24	Type wheel reciprocating drive lever, 52362
25	Flat washer, 52402
26	Type wheel reciprocating spring lever, 52405
27	Sleeve bearing, 52401
28	Flat washer, 52402
29	Spring pin, 52403
30	Type wheel reciprocating drive lever, 52362
31	Flat washer, 53261
32	Flat washer, 52413
33	Spring, 52168
34	Figures-letters shift lever, 52406
35	Flat washer, 53261
36	Self-locking hexagonal nut, 10525
37	Type wheel shift lever stud, 52417
38	Bell sensing lever spring, 52173
39	Shift cam follower spring, 52172
40	Letters sensing lever spring, 52169
41	Figures sensing lever spring, 52171
42	Machine screw, 10076
43	Lockwasher, 10430
44	Machine screw, 10025
45	Lockwasher, 10430
46	Function plate, 52419A

Figure 284. Type wheel reciprocating mechanism, exploded view.

engages both type wheel reciprocating drive levers. Install the retainer plate (22) and shaft collar (21) on the type wheel shift lever stud (37); secure with two setscrews (20).

(7) Install the type wheel reciprocating lever spring (19) on the spring pin (29) and on the type wheel reciprocating spring lever (26).

(8) Position the type wheel reciprocating transfer lever eccentric stud (18) on the function plate (46); secure with a flat washer (17) and self-locking hexagonal nut (16).

(9) Position the type wheel reciprocating transfer lever (15) on the type wheel reciprocating transfer lever eccentric stud (18); secure with a retainer ring (14).

(10) Position the code-ring locking bail shaft (12) on the function plate (46). Position the letters figures shift latch (13) on the code-ring locking bail shaft; secure the letters figures shift latch to the code-ring locking bail shaft and the code-ring locking bail shaft to the function plate (46) with four retainer rings (11).

(11) Position the code-ring locking bail (10) on the code-ring locking bail shaft (12); secure with two machine screws (7), lockwashers (9), and flat washers (8).

(12) Position the code-ring locking bail cam follower (6) on the code-ring locking bail shaft (12); secure with a machine screw (2), lockwasher (5), flat washer (4), and anchor nut (3).

(13) Install the code-ring locking bail cam follower spring (1) on the code-ring locking bail cam follower (6) and on the function plate (46).

(14) Adjust the type wheel reciprocating mechanism as described in paragraphs 442, 443, 451, 464, 465, 466 and 472.

278. Disassembly and Reassembly of Function Sensing Mechanism

(fig. 285)

a. Disassembly.

(1) Remove the two machine screws (1) and lockwashers (2) that hold the stop arm shaft support plate (3) to the perforator frame; remove the stop arm shaft support plate, pulling it free of the selector stop arm shaft.

(2) Remove the type wheel reciprocating mechanism as described in paragraph 277*a*.

(3) Remove the two setscrews (4) that hold the stop arm shaft driven gear (5) to the stop arm shaft; remove the stop arm shaft driven gear and thrust bearing (6).

(4) Remove the type wheel reciprocating cam follower (7), sensing lever spacer (8), and the assembled bell sensing lever (11) and signal bell clapper (10) from the cam lever assembly (21).

(5) Remove the setscrew (9) that holds the signal bell clapper (10) to the bell sensing lever (11); remove the signal bell clapper.

(6) Remove the sensing lever spacer (12), figures sensing lever (13), sensing lever spacer (14), letters sensing lever (15), sensing lever spacer (16) from the cam lever assembly (21).

(7) Remove the cam lever assembly (21) and laminated spacer (22) from the projection of the rear of the code-ring cage.

(8) Remove the plain hexagonal nut (17), flat washer (18), and lockwasher (19) that hold the restoring lever eccentric (20) to the stud on the cam lever assembly (21); remove the restoring lever eccentric.

b. Reassembly.

(1) Position the restoring lever eccentric (20) on the stud on the cam lever assembly (21); secure with a flat washer (18), lockwasher (19), and plain hexagonal nut (17).

(2) Position the laminated spacer (22) and cam lever assembly (21) on the projection on the rear of the code-ring cage.

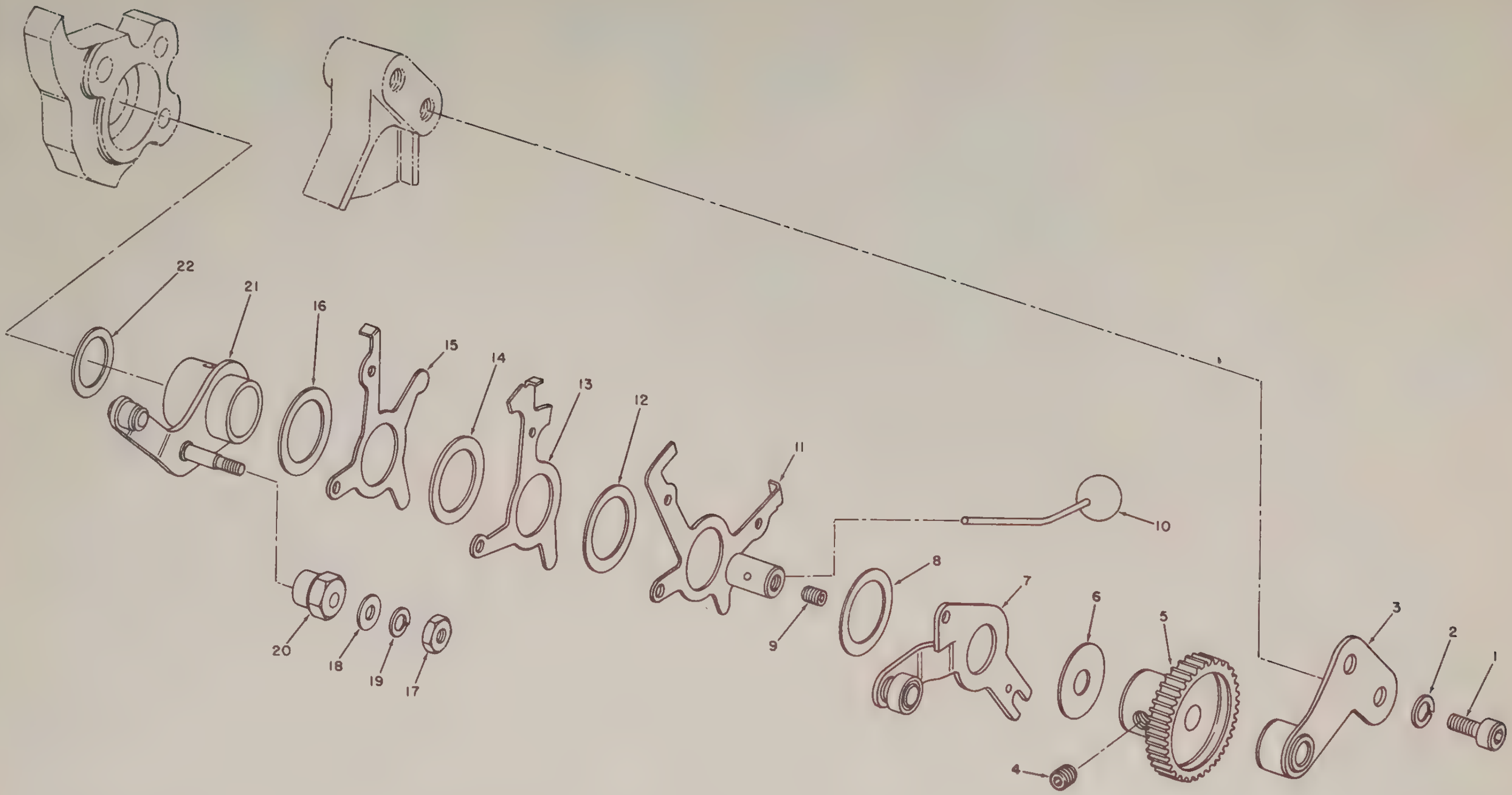
(3) Position the sensing lever spacer (16), letters sensing lever (15), sensing lever spacer (14), figures sensing lever (13), sensing lever spacer (12) on the cam lever assembly (21).

(4) Position the signal bell clapper (10) on the bell sensing lever (11); secure with a setscrew (9).

(5) Position the assembled bell sensing lever (11), sensing lever spacer (8), and type wheel reciprocating cam follower (7) on the cam lever assembly (21).

(6) Position the thrust bearing (6) and stop arm shaft driven gear (5) on the selector stop arm shaft; secure with two setscrews (4).

(7) Position the stop arm shaft support plate



1	Machine screw, 10008
2	Lockwasher, 10430
3	Stop arm shaft support plate, 53568A
4	Setscrew, 10209
5	Stop arm shaft driven gear, 52344
6	Thrust bearing, 50374
7	Type wheel reciprocating cam follower, 52477A
8	Sensing lever spacer, 52649
9	Setscrew, 10203
10	Signal bell clapper, 52682
11	Bell sensing lever, 52638A
12	Sensing lever spacer, 52649
13	Figures sensing lever, 52483
14	Sensing lever spacer, 52649
15	Letters sensing lever, 52484
16	Sensing lever spacer, 52649
17	Plain hexagonal nut, 10512
18	Flat washer, 50414
19	Lockwasher, 10429
20	Restoring lever eccentric, 52664
21	Cam lever assembly, 52459A
22	Laminated spacer, 52679

Figure 285. Function sensing mechanism, exploded view.

(3) on the stop arm shaft and on the perforator frame; secure with two machine screws (1) and lockwashers (2).

(8) Install the type wheel reciprocating mechanism as described in paragraph 277*b*.

(9) Adjust the function sensing lever mechanism as described in paragraphs 442, 443, 452, 467, 468, and 469.

279. Removal and Replacement of Code-ring Cage

(fig. 286)

a. Removal.

(1) Remove the ribbon supply group from the perforator as described in paragraph 253*a*.

(2) Remove the front support assembly as described in paragraph 255*a*.

(3) Remove the stop arm shaft driven gear as described in paragraph 278*a*(3).

(4) Remove the assembled type wheel driven gear (4), square shaft stop arm (6), and stop arm shaft (7).

(5) Remove the two machine screws (1) and lockwashers (2) that hold the code-ring cage to the perforator frame; remove the code-ring cage.

b. Replacement.

(1) Position the code-ring cage on the perforator frame, carefully engaging the tails of the T-levers in the slotted tails of the code rings; secure with two machine screws (1) and lockwashers (2).

(2) Install the assembled type wheel driven gear (4), square shaft stop arm (6), and stop arm shaft (7).

(3) Install the stop arm shaft driven gear as described in paragraph 278*b*(6).

(4) Install the front support assembly as described in paragraph 255*a*.

(5) Install the ribbon supply group as described in paragraph 253*b*.

(6) Adjust the code-ring cage as described in paragraphs 442, 443, 444, 445, 451, 453, and 469.

280. Disassembly and Reassembly of Code-ring Cage

(fig. 286)

a. Disassembly.

(1) Remove the code-ring cage as described in paragraph 279*a*.

(2) Remove the two setscrews (3) that hold the type wheel driven gear (4) to the stop arm shaft (7); remove the type wheel driven gear.

(3) Remove the machine screw (5) that holds the square shaft stop arm (6) to the stop arm shaft (7); remove the square shaft stop arm.

(4) Remove the 16 stop bar lever springs (8) from the stop bars (9) and from the function stop bars (10). Remove the 29 stop bars and the 3 function stop bars from the code-ring cage.

(5) Remove the three machine screws (11) and lockwashers (12) that hold the retainer plate (13) to the code selecting guide plate (22); remove the retainer plate.

(6) Remove the three machine screws (14), flat washers (17), and lockwashers (18) that hold the adjustable fulcrums (16) to the code selecting guide plate 22); remove the adjustable fulcrums and flat washers (15).

(7) Remove the three self-locking hexagonal nuts (19) and cage tie bolts (20) that hold the code cage outside guide (23) to the code selecting guide plate (22). Remove the two setscrews (21) that hold the code cage spacer (24) to the code-ring collar (37). Remove the code selecting guide plate and the code cage outside guide from the code cage spacer.

(8) Disassemble the code ring spacer (25), six ball retainers (26, 28, 30, 32, 34, an 36) five code rings (27, 29, 31, 33, and 35), and the code-ring collar (37).

b. Reassembly.

(1) Position the code-ring collar (37) on the hub of the code selecting guide plate (22). Position the code cage spacer (24) on the code selecting guide plate.

(2) Position the six ball retainers (36, 34, 32, 30, 28, and 26) and five code rings (35, 33, 31, 29, and 27) on the hub of the code selecting guide plate (22) alternating a ball retainer and a code ring, starting with a ball retainer and No. 5 code ring and installing the code rings in descending numerical order. Install the code ring spacer (25).

(3) Install the two setscrews (21) that hold the code cage spacer (24) to the code-ring collar (37).

(4) Position the code cage outside guide (23) on the code cage spacer (24) and on the code selecting guide plate (22); secure with three cage tie bolts (20) and self-locking hexagonal nuts (19).

(5) Position the three flat washers (15) and adjustable fulcrums (16) on the code selecting guide plate (22); secure with three machine screws (14), lockwashers (18), and flat washers (17).

(6) Position the retainer plate (13) on the code selecting guide plate (22); secure with three machine screws (11) and lockwashers (12).

(7) Install the three function stop bars (10) and 29 stop bars (9), positioning the stop bars in pairs and installing one stop bar lever spring (8) for each pair of stop bars.

(8) Position the square shaft stop arm (6) on the stop arm shaft (7); secure with a machine screw (5).

(9) Position the type wheel driven gear (4) on the stop arm shaft (7); secure with two setscrews (3), being careful to line up the holes in the type wheel driven gear with the flats in the stop arm shaft.

(10) Install the code-ring cage as described in paragraph 279*b*.

281. Removal and Replacement of Gear Case

(fig. 258)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the motor as described in paragraph 240*a*.

(3) Remove the worm gear from the main shaft as described in paragraph 271*a*(4).

(4) Remove the machine screw (27) and lockwasher (28) that hold the gear case (8) to the frame (52); remove the gear case.

(5) Remove the two dowels (7) from the perforator frame (52) only if they are loose or damaged.

b. Replacement.

(1) Install the two dowels (7) in the perforator frame (52) if they have been removed.

(2) Position the gear case on the perforator frame (52), making sure the dowels are properly seated in the holes in the gear case; secure with a machine screw (27) and lockwasher (28).

(3) Install the worm gear on the mainshaft as described in paragraph 271*b*(6).

(4) Install the motor as described in paragraph 240*b*.

(5) Install the perforator on the perforator base as described in paragraph 229*b*.

282. Removal and Replacement of Transmitter-Distributor Mounting Frame Casting

(fig. 258)

a. Removal.

(1) Remove the transmitter-distributor from the XMTR support frame (11) of the perforator as described in paragraph 230*a*.

(2) Remove the two machine screws (9) and lockwashers (10) that hold the XMTR support frame (11) to the perforator frame (52); remove the XMTR support frame.

b. Replacement.

(1) Position the XMTR support frame (11) on the perforator frame (52); secure with two machine screws (9) and lockwashers (10).

(2) Install the transmitter-distributor on the XMTR support frame (11) as described in paragraph 230*b*.

283. Removal and Replacement of Signal Bell and Selector-Magnet Bracket Adjustment Screws

(fig. 258)

a. Removal.

(1) Remove the machine screw (12), lockwasher (13), and flat washer (14) that hold the signal bell (15) to the perforator frame (52); remove the signal bell.

(2) Remove the two machine screws (40) and lockwashers (41) that hold the two anchor plates (42) to the perforator frame (52); remove the anchor plates.

(3) Remove the two selector-magnet bracket adjustment screws (43) from the perforator frame (52).

b. Replacement.

(1) Install the two selector-magnet bracket adjustment screws (43) on the perforator frame (52).

(2) Position the two anchor plates (42) which lock the setting of the selector-magnet bracket adjustment screws on the perforator frame (52); secure with two machine screws (40) and lockwashers (41).

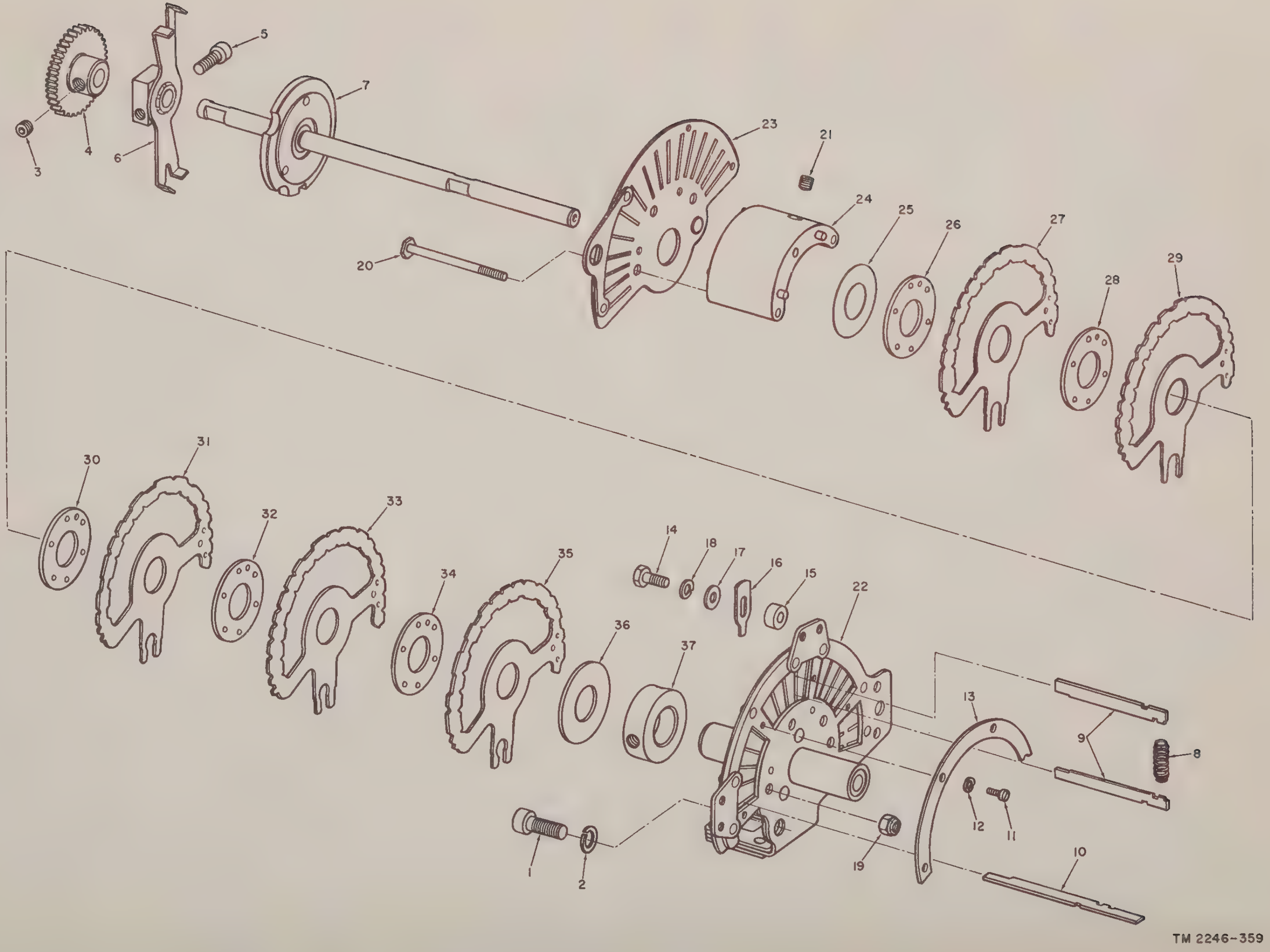


Figure 286. Code-ring cage, exploded view.

1 Machine screw, 10024
2 Lockwasher, 10431
3 Setscrew, 10209
4 Type wheel driven gear, 52431
5 Machine screw, 10009
6 Square shaft stop arm, 53802A
7 Stop arm shaft, 54710A
8 Stop bar lever spring, 52940
9 Stop bar, 50502
10 Function stop bar, 52333
11 Machine screw, 10317
12 Lockwasher, 10433
13 Retainer plate, 56177
14 Machine screw, 10398
15 Flat washer, 53602
16 Adjustable fulcrum, 52177
17 Flat washer, 10458
18 Lockwasher, 10429
19 Self-locking hexagonal nut, 10500
20 Cage tie bolt, 53912
21 Setscrew, 10209
22 Code selecting guide plate, 52517
23 Code cage outside guide, 52444
24 Code cage spacer, 53445
25 Code ring spacer, 53453
26 Ball retainer, 53647
27 Code ring, 53641A
28 Ball retainer, 53647
29 Code ring, 53642A
30 Ball retainer, 53647
31 Code ring, 53643A
32 Ball retainer, 53647
33 Code ring, 53644A
34 Ball retainer, 53647
35 Code ring, 53645A
36 Ball retainer, 53647
37 Code-ring collar, 51397

Figure 286—Continued.

(3) Position the signal bell (15) on the perforator frame (52); secure with a machine screw (12), flat washer (14), and lockwasher (13).

284. Removal and Replacement of Miscellaneous Perforator Frame Connecting Hardware

(fig. 258)

a. Perforator Frame Mounting Hardware. Four machine screws (18), eight lockwashers (19 and 21), and four grounding straps (20) are used to secure the perforator frame (52) to the vibration mounts on the perforator base.

b. Perforator Frame Connecting Hardware. Four machine screws (22, 24, 27, and 29) and lockwashers (23, 25, 28, and 30) hold the motor support frame and the selector frame of the perforator together. Two dowels are inserted between the components of the frame to keep the frame in alinement. Remove and replace frame hardware only if it is broken or damaged.

Note. The perforator frame (52) is made up of two major units and a number of bearing caps, all of which are machined, drilled, and tapped together to insure the correct alinement of the components. For this reason, the perforator frame is sold only as a unit and must be replaced as such. Never disassemble the perforator frame unless it is to be replaced.

285. Disassembly and Reassembly of Perforator Tape Reel

(fig. 287)

a. Disassembly.

(1) Disconnect the plug connector that connects the tape reel to the perforator base.

(2) Remove the four machine screws (1) and lockwashers (2) that hold the tape reel bracket (20) to the power supply chassis assembly; remove the tape reel assembly.

(3) Remove the alarm lever spring (3) from the alarm lever (5) and from the tape reel bracket (20).

(4) Remove the retainer ring (4) that holds the alarm lever (5) to the stud on the tape reel bracket (20); remove the alarm lever.

(5) Remove the self-locking hexagonal nut (6) and flat washer (7) that hold the switch actuating stud (8) to the alarm lever (5); remove the switch actuating stud.

(6) Remove the three self-locking hexagonal nuts (9) and machine screws (10) that hold the tape reel hub (11) to the tape reel (15); remove the tape reel hub.

(7) Remove the self-locking hexagonal nut (12) and screw (13) that hold the ball bearing (14) to the tape reel bracket (20); remove the ball bearing and tape reel (15).

(8) Remove the two self-locking hexagonal nuts (16) and machine screws (17) that hold the roller support springs (18) to the tape reel bracket (20). Remove the roller support springs and the guide roller (19).

b. Reassembly.

(1) Position the guide roller (19) on the roller support springs (18). Position the assembly guide roller and roller support springs on the tape reel bracket (20); secure with two machine screws (17) and self-locking hexagonal nuts (16).

(2) Position the tape reel (15) and the ball bearing (14) on the tape reel bracket (20); secure with a screw (13) and self-locking hexagonal nut (12).

(3) Position the tape reel hub (11) on the tape reel (15); secure with three machine screws (10) and self-locking hexagonal nuts (9).

(4) Position the switch actuating stud (8) on the alarm lever (5); secure with a flat washer (7) and self-locking hexagonal nut (6).

(5) Position the alarm lever (5) on the stud on the tape reel bracket (20); secure with a retainer ring (4).

(6) Install the alarm lever spring (3) on the alarm lever and on the tape reel bracket (20).

(7) Position the tape reel assembly on the power supply chassis assembly; secure with four machine screws (1) and lockwashers (2).

(8) Connect the plug connector from the tape reel to the perforator base.

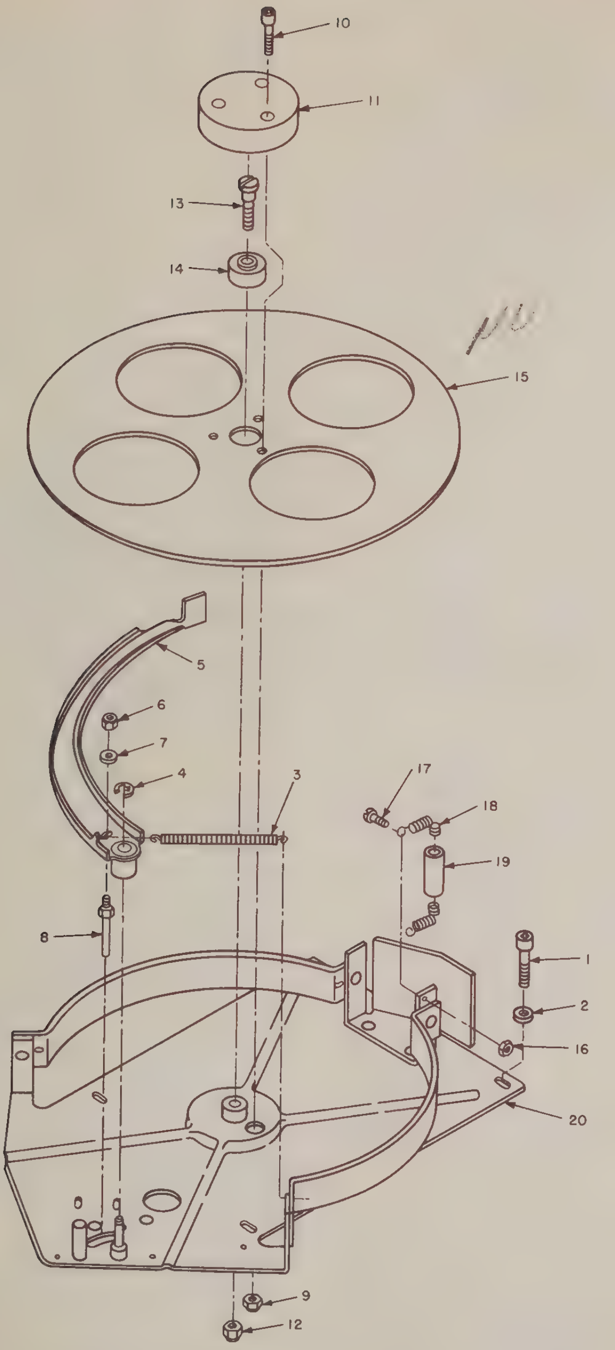
(9) Adjust the tape reel assembly as instructed in paragraph 498.

286. Disassembly and Reassembly of Tape-Out Alarm Switch and Tape Alarm Buzzer Group

(fig. 288)

a. Disassembly.

(1) Remove the tape reel assembly from the



TM 2246-168

1 Machine screw, 10064
2 Lockwasher, 10403
3 Alarm lever spring, 52576
4 Retainer ring, 10949
5 Alarm lever, 52542A
6 Self-locking hexagonal nut, 10500
7 Flat washer, 10450
8 Switch actuating stud, 52278
9 Self-locking hexagonal nut, 10500
10 Machine screw, 10006
11 Tape reel hub, 52128
12 Self-locking hexagonal nut, 10525
13 Screw, 52541
14 Ball bearing, 10762
15 Tape reel, 56026
16 Self-locking hexagonal nut, 10551
17 Machine screw, 10335
18 Roller support spring, 56024
19 Guide roller, 56023
20 Tape reel bracket, 56030

Figure 287. Tape reel, exploded view.

power supply chassis as described in paragraph 285*a*(1) and (2).

(2) Remove the spring (1) from the switch actuating arm latch (3) and from the spring post on the tape reel bracket.

(3) Remove the retainer ring (2) that holds the switch actuating arm latch (3) to the stud on the tape reel bracket; remove the switch actuating arm latch.

(4) Remove the supply reel tension spring (4) from the switch actuating lever (6) and from the spring post on the tape reel bracket.

(5) Remove the retainer ring (5) that holds the switch actuating lever (6) to the stud on the tape reel bracket; remove the switch actuating lever.

(6) Remove the two self-locking hexagonal nuts (7) and machine screws (8) that hold the alarm switch (9) to the tape reel bracket. Unsolder the electrical wire (19) and the wire from the cable (20) and remove the alarm switch and two collars (10). Tag the electrical wires to facilitate reassembly.

(7) Remove the self-locking hexagonal nut (11) and machine screw (12) that hold the electrical clamp (14) and one side of the tape alarm buzzer (18) to the tape reel bracket; remove the electrical clamp and the ground lead from the cable.

(8) Remove the self-locking hexagonal nut (15) and machine screw (16) that hold the tape alarm buzzer (18) to the tape reel bracket; remove the flat washer (17) and lockwasher (13). Disconnect the electrical wires from the tape alarm buzzer and remove the tape alarm buzzer. Tag the electrical wires to facilitate reassembly.

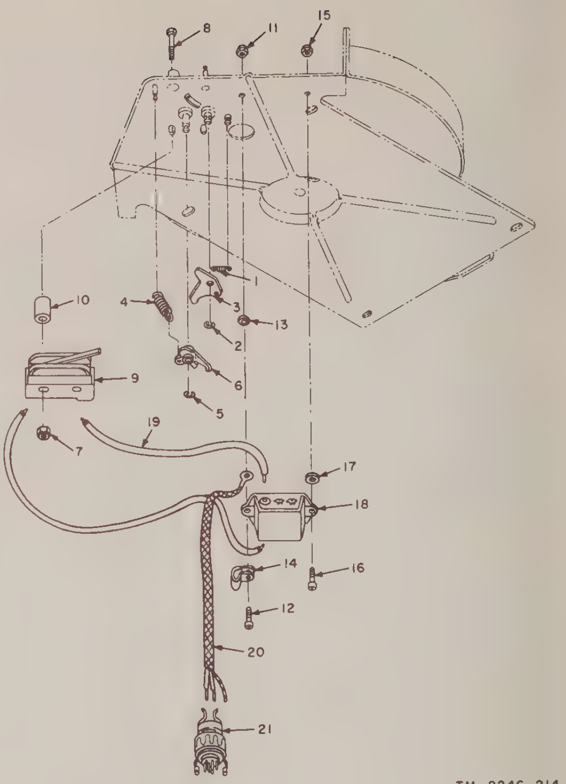
(9) Disconnect the plug connector (21) from the cable.

b. Reassembly.

(1) Connect the electrical wire (19) and a wire from the cable (20) to the tape alarm buzzer (18). Position the lockwasher (13), ground wire of the cable (20), flat washer (17), and tape alarm buzzer on the tape reel bracket. Secure one side of the tape alarm buzzer with a machine screw (16) and self-locking hexagonal nut (15).

(2) Install the cable in the electrical clamp (14) and position the electrical clamp on the tape alarm buzzer (18). Secure the tape alarm buzzer and the electrical clamp to the tape reel bracket with a machine screw (12) and self-locking hexagonal nut (11).

(3) Solder the electrical wire (19) and the remaining wire of the cable (20) to the



1	Spring, 52212
2	Retainer ring, 10949
3	Switch actuating arm latch, 52281
4	Supply reel tension spring, 52266
5	Retainer ring, 10949
6	Switch actuating lever, 52279A
7	Self-locking hexagonal nut, 10500
8	Machine screw, 10082
9	Alarm switch (S16), 20108
10	Collar, 52272
11	Self-locking hexagonal nut, 10500
12	Machine screw, 10004
13	Lockwasher, 10403
14	Electrical clamp, 20517
15	Self-locking hexagonal nut, 10500
16	Machine screw, 10004
17	Flat washer, 10467
18	Tape alarm buzzer, I5, 20783
19	Wire, 22202
20	Cable, 56805A
21	Plug connector, 20419

Figure 288. Tape-out alarm switch and tape alarm buzzer group, exploded view.

alarm switch (9). Position the two collars (10) and the alarm switch on the tape reel bracket; secure with two machine screws (8) and self-locking hexagonal nuts (7).

(4) Position the switch actuating lever (6) on the stud on the tape reel bracket; secure with a retainer ring (5).

(5) Position the supply reel tension spring (4) on the switch actuating lever (6) and on the spring post on the tape reel bracket.

(6) Position the switch actuating arm latch (3) on the stud on the tape reel bracket; secure with a retainer ring (2).

(7) Install the spring (1) on the switch actuating arm latch and on the spring post on the tape reel bracket.

(8) Install the tape reel assembly on the power supply chassis as described in paragraph.

(9) Adjust the tape reel assembly as directed in paragraph 498.

287. Disassembly and Reassembly of Vibration Mounts

(fig. 289)

a. Disassembly.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the four machine screws (3) and lockwashers (4) that hold each of the four vibration mounts (10) to the perforator main base (127); remove the four vibration mounts.

(3) Remove the plain hexagonal nut (5) from one of the vibration mount studs (6); remove the vibration mount stud.

(4) Disassemble the lockwasher (7), vibration mount limit stop (8), flat washer (9), vibration mount (10), flat washer (11), and vibration mount limit stop (12).

(5) Repeat (3) and (4) above to disassemble the three remaining vibration mounts.

b. Reassembly.

(1) Assemble the vibration mount limit stop (12), flat washer (11), vibration mount (10), flat washer (9), and vibration mount limit stop (8).

(2) Insert a vibration mount stud (6) through the assembly; secure with a lockwasher (7) and plain hexagonal nut (5).

(3) Repeat (1) and (2) above to similarly reassemble the remaining three vibration mounts.

(4) Position the four vibration mounts on the perforator main base; secure each with four machine screws (3) and lockwashers (4).

(5) Install the perforator on the perforator base as described in paragraph 229*b*.

288. Disassembly and Reassembly of Dust Cover Arms and Guides

(fig. 289)

a. Disassembly.

(1) Remove the arm locking spring (110) from the spring post (117) on the main base (127) and from the dust cover arm (115).

(2) Remove the machine screw (111), anchor nut (112), and flat washer (113) from the dust cover arm (115).

(3) Remove the dust cover knob (114) to release the dust cover arm (115) and flat washer (116).

(4) Remove the spring post (117) from the main base (127).

(5) Repeat (1) through (4) above to similarly disassemble the opposite dust cover arm (115).

(6) Remove the four machine screws (83) and lockwashers (84) that hold the two dust cover guides (85) to the main base (127); remove the dust cover guides.

b. Replacement.

(1) Position the two dust cover guides (85) on the main base (127); secure with four machine screws (83) and lockwashers (84).

(2) Install the spring posts (117) in the main base (127).

(3) Position the dust cover arm (115) and flat washer (116) on the main base (127); install the dust cover knob (114).

(4) Install the anchor nut (112), machine screw (111), and flat washer (113) to secure the dust cover knob (114) to the dust cover arm (115).

(5) Install the arm locking spring (110) on the dust cover arm (115) and on the spring post (117) on the main base (127).

(6) Repeat (2) through (5) above to assemble the opposite dust cover arm (115).

(7) Adjust the dust cover arms as directed in paragraph 504.

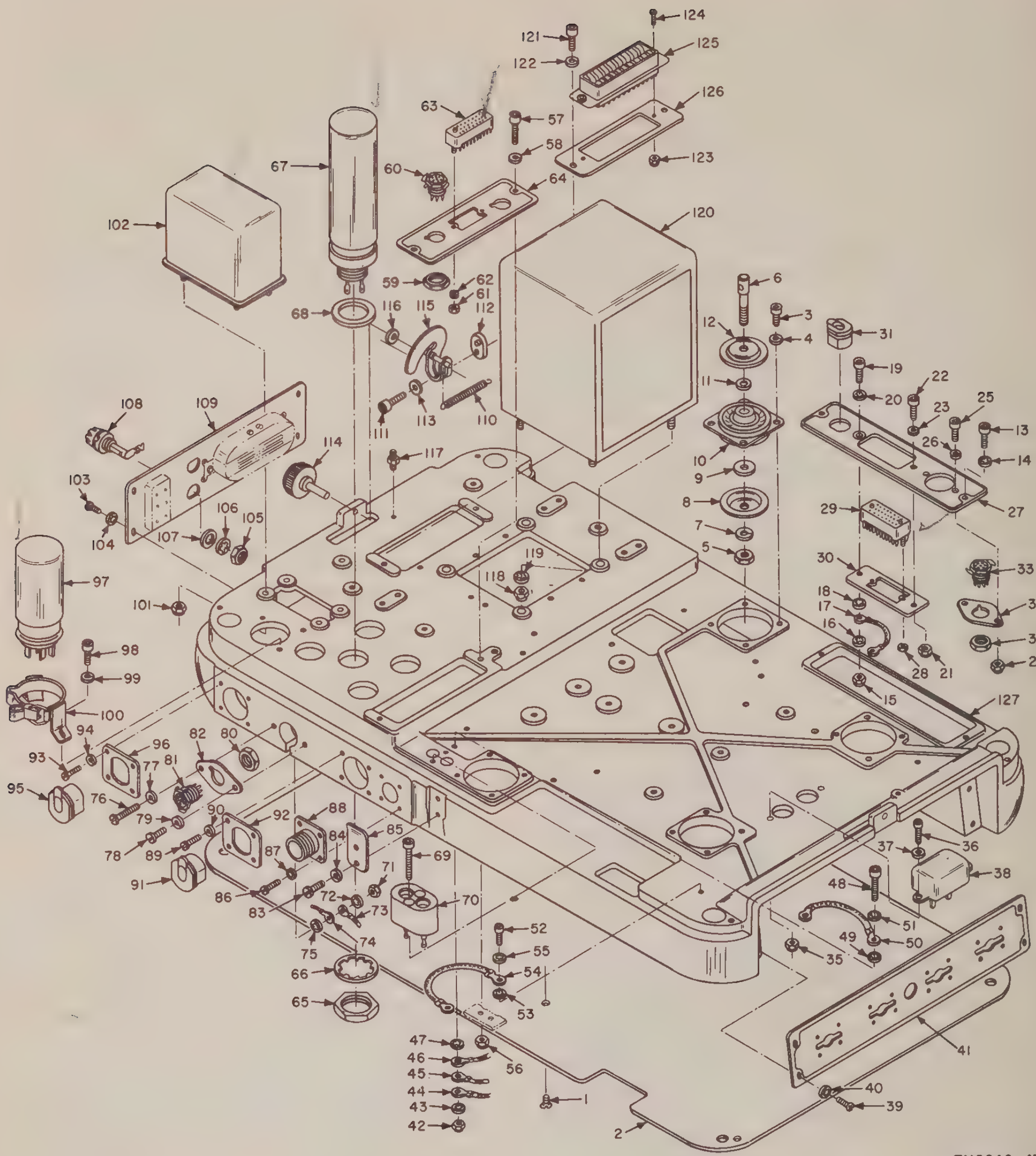


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Figure 289. Perforator base, exploded view.

289. Removal and Replacement of Capacitors, Transformer, and Relay

(fig. 289)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Tilt the perforator main base (127) and remove the seven machine screws (1) that hold the base plate (2) to the main base; remove the base plate.

(3) Remove the two machine screws (36) and flat washers (37) that hold the fixed capacitor (38) to the main base (127); unsolder the electrical leads and remove the fixed capacitor. Tag the leads to facilitate reassembly.

(4) Remove the five nuts (65) and lockwashers (66) that hold the five fixed capacitors (67) to the main base (127); unsolder the electrical leads to the capacitors and remove the capacitors and flat washers (68).

(5) Loosen the capacitor clamp (100). Unsolder the leads to the capacitor (97); remove the capacitor. Remove the three machine screws (98) and lockwashers (99) that hold the capacitor clamp to the main base (127); remove the capacitor clamp.

(6) Remove the four machine screws that hold the power supply chassis assembly to the perforator main base (127); remove the power supply chassis assembly. Remove the four self-locking hexagonal nuts (118) and lockwashers (119) that hold the power transformer (120) to the main base (127); remove the electrical leads and remove the power transformer.

(7) Remove the four self-locking hexagonal

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1 Machine screw, 10179
2 Base plate, 56062
3 Machine screw, 10008
4 Lockwasher, 10430
5 Plain hexagonal nut, 10502
6 Vibration mount stud, 53557
7 Lockwasher, 10427
8 Vibration mount limit stop, 54127
9 Flat washer, 50862
10 Vibration mount, 10911
11 Flat washer, 50494
12 Vibration mount limit stop, 54127
13 Machine screw, 10008
14 Lockwasher, 10404
15 Self-locking hexagonal nut, 10501
16 Lockwasher, 10404
17 Ground strap (includes terminals 20838 and 20355 and wire)
18 Lockwasher, 10404
19 Machine screw, 10008
20 Lockwasher, 10404
21 Self-locking hexagonal nut, 10501
22 Machine screw, 10008
23 Lockwasher, 10430
24 Self-locking hexagonal nut, 10501
25 Machine screw, 10008
26 Lockwasher, 10430
27 Mounting plate, 56051
28 Plain hexagonal nut
29 Receptacle connector (includes item 28)
30 Connector plate, 56044
31 Bushing insulator, 20713
32 Hexagonal nut
33 Receptacle connector S24 (includes item 32)
34 Socket plate, 56069
35 Self-locking hexagonal nut, 10501
36 Machine screw, 10010
37 Flat washer, 10467
38 Fixed capacitor, C19
39 Machine screw, 10376
40 Lockwasher, 10404
41 Switch plate, 56055A
42 Self-locking hexagonal nut, 10501
43 Lockwasher, 10404
44 Terminal lug, 20838
45 Terminal lug, 20838
46 Terminal lug, 20838
47 Lockwasher, 10404
48 Machine screw, 10028
49 Lockwasher, 10404
50 Grounding lead, 53651A
51 Lockwasher, 10404
52 Machine screw, 10008-1
53 Lockwasher, 10404
54 Grounding lead, 53651
55 Lockwasher, 10404
56 Self-locking hexagonal nut, 10501
57 Machine screw, 10037
58 Lockwasher, 10430
59 Hexagonal nut
60 Receptacle connector, J34 (includes item 59)
61 Nut
62 Lockwasher
63 Receptacle connector, J15 (includes items 61 and 62)
64 Mounting plate, 56052
65 Nut
66 Lockwasher
67 Fixed capacitors, C12, C13, C14, C15, C18 (includes items 65, 66, and 68)
68 Flat washer
69 Machine screw, 10012
70 Receptacle connector, J12
71 Self-locking hexagonal nut, 10501
72 Lockwasher, 10404
73 Electrical terminal, 20838
74 Electrical terminal, 20710
75 Lockwasher, 10404
76 Machine screw, 10112
77 Lockwasher, 10430
78 Machine screw, 10252
79 Lockwasher, 10429
80 Nut
81 Receptacle connector, J14 (includes item 80)
82 Socket plate, 56069
83 Machine screw, 10252
84 Lockwasher, 10430
85 Dust cover guide, 56071
86 Machine screw, 10335
87 Lockwasher, 10408
88 Electrical connector shell, 20438
89 Machine screw, 10375
90 Lockwasher, 10429
91 Bushing insulator, 20835
92 Mounting plate, 56049
93 Machine screw, 10395
94 Lockwasher, 10429
95 Bushing insulator, 20835
96 Mounting plate, 56049
97 Capacitor C7A, C7B
98 Machine screw, 10003
99 Lockwasher, 10429
100 Capacitor clamp, 20524
101 Self-locking hexagonal nut, 10501
102 Automatic line return relay, K1
103 Machine screw, 10376
104 Lockwasher, 10404
105 Hexagonal nut
106 Lockwasher
107 Rubber washer
108 Fuse holder F5, F6 (includes items 105, 106, and 107)
109 Switch plate, 56070A
110 Arm locking spring, 55014
111 Machine screw, 10010
112 Anchor nut, 52073
113 Flat washer, 10467
114 Dust cover knob, 55013
115 Dust cover arm, 55010A (LH), 55015A (RH)
116 Flat washer, 10464
117 Spring post, 50649
118 Self-locking hexagonal nut, 10525
119 Lockwasher, 10404
120 Power transformer, T2
121 Machine screw, 10025
122 Lockwasher, 10430
123 Nut
124 Machine screw
125 Receptacle connector, 20270 (includes items 123 and 124)
126 Power supply mounting plate, 56048
127 Main base, 54654

Figure 289—Continued.

nuts (101) that hold the automatic line return relay (102) to the main base (127); unsolder the electrical leads from the automatic line return relay and remove the automatic line return relay.

b. Replacement.

(1) Position the automatic line relay (102) on the main base (127); secure with four self-locking hexagonal nuts (101). Connect the electrical leads to the automatic line return relay.

(2) Position the power transformer (120) on the main base (127); secure with four self-locking hexagonal nuts (118) and lockwashers (119). Connect the electrical leads to the power transformer. Position the power supply chassis assembly on the main base (127); secure with four machine screws and lockwashers.

(3) Position the capacitor clamp (100) on the main base (127); secure with three machine screws (98) and lockwashers (99). Position the capacitor (97) in the capacitor clamp and secure the clamp. Solder the electrical leads to the capacitor.

(4) Position the five fixed capacitors (67) and flat washers (68) on the main base (127); secure with five nuts (65) and lockwashers (66). Solder the electrical leads to the capacitors.

(5) Position the fixed capacitor (38) on the main base (127); secure with two machine screws (36) and flat washers (37).

(6) Tilt the main base (127) and position the base plate (2) on the main base; secure with seven machine screws (1).

(7) Install the perforator on the perforator main base (127) as described in paragraph 229*b*.

290. Removal and Replacement of Grounding Leads

(fig. 289)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the base plate (2) from the main base (127) as described in paragraph 289*a*(2).

(3) Remove the self-locking hexagonal nut (42), lockwasher (43), three terminal lugs (44, 45, and 46), and lockwasher (47) from the machine screw (48) that holds the left rear grounding lead (50) to the main base (127); remove the machine screw, lockwasher (49), grounding lead, and lockwasher (51).

(4) Remove the remaining three machine screws (52); lockwashers (53), grounding leads (54), and lockwashers (55).

b. Replacement.

(1) Install a lockwasher (53), grounding lead (54), lockwasher (55) and machine screw (52) near each of the vibration mount positions except the left rear position.

(2) Position a lockwasher (49), grounding lead (50), lockwasher (51) and machine screw (48) in the left rear ground screw position on the main base (127). Tilt the main base and position a lockwasher (47), three terminal lugs (46, 45, and 44), and a lockwasher (43) on the machine screw; secure with a self-locking hexagonal nut (42).

(3) Install the base plate (2) on the main base (127) as described in paragraph 289*b*(6).

(4) Install the perforator on the perforator base as described in paragraph 229*b*.

291. Removal and Replacement of Front and Rear Switch Plates

(fig. 289)

a. Removal.

(1) Remove the base plate (2) from the main base (127) as described in paragraph 289*a*(2).

(2) Remove the four machine screws that hold each of the four pile-up lever switches to the front switch plate (41).

(3) Remove the nut that holds the toggle switch to the front switch plate.

(4) Remove the four machine screws (39) and lockwashers (40) that hold the front switch plate (41) to the main base (127); remove the front switch plate.

(5) Remove the nut that holds the toggle switch to the rear switch plate (109).

(6) Remove the two machine screws, lockwashers, and plain hexagonal nuts that hold the convenience outlet to the rear switch plate (109).

(7) Disconnect the electrical leads from the two fuse holders (108). Remove the two hexagonal nuts (105), lockwashers (106), and rubber washers (107) that hold the

fuse holders to the rear switch plate (109); remove the fuse holders.

(8) Remove the four machine screws (103) and lockwashers (104) that hold the rear switch plate (109) to the main base (127); remove the rear switch plate.

b. Replacement.

(1) Position the rear switch plate (109) on the main base (127); secure with four machine screws (103) and lockwashers (104).

(2) Position the two fuse holders (108) on the rear switch plate (109); secure with two rubber washers (107), lockwashers (106), and hexagonal nuts (105). Connect the electrical leads to the fuse holders.

(3) Position the convenience outlet on the rear switch plate (109); secure with two machine screws, lockwashers, and plain hexagonal nuts.

(4) Position the toggle switch on the rear switch plate (109); secure with a nut.

(5) Position the front switch plate (41) on the main base (127); secure with four machine screws (39) and lockwashers (40).

(6) Position the toggle switch on the front switch plate (41); secure with a nut.

(7) Install the four machine screws that hold each of the four pileup lever switches to the front switch plate (41).

(8) Install the base plate (2) on the main base (127) as described in paragraph 289*b*(6).

292. Removal and Replacement of Receptacle Connectors from Top of Main Base

(fig. 289)

a. Removal.

(1) Remove the perforator from the perforator base as described in paragraph 229*a*.

(2) Remove the base plate (2) from the main base (127) as described in paragraph 289*a*(2).

(3) Remove the power supply chassis from the main base (127) as described in paragraph 289*a*(6).

(4) Remove the two machine screws (69) that hold the receptacle connector (70) to the main base (127); disconnect the electrical leads and remove the receptacle connector.

(5) Remove the two machine screws (13) and lockwashers (14) that hold the mounting plate (27) to the main base (127).

(6) Remove the self-locking hexagonal nut (15), lockwasher (16), ground strap (17), lockwasher (18), machine screw (19), and lockwasher (20) that hold the one side of the connector plate (30) to the mounting plate (27). Remove the self-locking hexagonal nut (21), machine screw (22), and lockwasher (23) that hold the other side of the connector plate to the mounting plate.

(7) Remove the two self-locking hexagonal nuts (24), machine screws (25), and lockwashers (26) that hold the socket plate (34) to the mounting plate (27).

(8) Remove the cable from the bushing insulator (31) and remove the bushing insulator from the mounting plate (27); remove the mounting plate.

(9) Disconnect the electrical leads from the receptacle connector (29); remove the two hexagonal nuts (28) that hold the receptacle connector to the connector plate (30). Remove the receptacle connector.

(10) Unsolder the electrical leads from the receptacle connector (33). Remove the hexagonal nut (32) that holds the receptacle connector to the socket plate (34); remove the receptacle connector.

(11) Remove the two self-locking hexagonal nuts (56), machine screws (57), and lockwashers (58) that hold the mounting plate (64) to the main base (127).

(12) Unsolder the electrical leads from the receptacle connector (60). Remove the nut (59) that holds the receptacle connector to the mounting plate (64); remove the receptacle connector.

(13) Unsolder the electrical leads from the receptacle connector (63). Remove the two units (61) and lockwashers (62) that hold the receptacle connector to the mounting plate (64); remove the receptacle connector.

(14) Remove the two machine screws (121) and lockwashers (122) that hold the power supply mounting plate (126) to the main base (127).

(15) Disconnect the electrical leads from the receptacle connector (125). Remove the two self-locking hexagonal nuts (123) and machine screws (124) that hold the receptacle connector (125) to the power supply

mounting plate (126); remove the receptacle connector and power supply mounting plate.

b. Replacement.

(1) Position the receptacle connector (125) on the power supply mounting plate (126); secure with two machine screws (124) and self-locking hexagonal nuts (123). Solder the electrical leads to the receptacle connector.

(2) Position the power supply mounting plate (126) on the main base (127); secure with two machine screws (121) and lockwashers (122).

(3) Position the receptacle connector (63) on the mounting plate (64); secure with two nuts (61) and lockwashers (62). Solder the electrical leads to the receptacle connector.

(4) Position the receptacle connector (60) on the mounting plate (64); secure with a nut (59). Solder the electrical leads to the receptacle connector.

(5) Position the mounting plate (64) on the perforator main base (127); secure with two machine screws (57), lockwashers (58), and self-locking hexagonal nuts (56).

(6) Position the receptacle connector (33) on the socket plate (34); secure with a hexagonal nut (32). Solder the electrical leads to the receptacle connector.

(7) Position the receptacle connector (29) on the connector plate (30); secure with two hexagonal nuts (28). Solder the electrical leads to the receptacle connector.

(8) Install the cable in the bushing insulator (31). Position the bushing insulator on the mounting plate (27).

(9) Position the socket plate (34) on the mounting plate (27); secure with two machine screws (25), lockwashers (26), and self-locking hexagonal nuts (24).

(10) Position the connector plate (30) on the mounting plate (27); secure the front side of the connector plate with a machine screw (22), lockwasher (23), and self-locking hexagonal nut (21). Secure the other side with a machine screw (19), lockwasher (20), lockwasher (18), ground strap (17), lockwasher (16), and self-locking hexagonal nut (15).

(11) Position the mounting plate (27) on the main base (127); secure with two machine screws (13) and lockwashers (14).

(12) Connect the electrical leads to the receptacle connector (70). Position the receptacle connector on the main base (127); secure with two machine screws (69).

(13) Install the power supply chassis on the main base (127) as described in paragraph 289*b*(2).

(14) Install the base plate (2) on the main base (127) as described in paragraph 289*b*(6).

(15) Install the perforator on the perforator base as described in paragraph 229*b*.

293. Removal and Replacement of Receptacle Connectors and Mounting Plates from Left Side of Main Base

(fig. 289)

a. Removal.

(1) Remove the base plate (2) from the main base (127) as described in paragraph 289*a*(2).

(2) Remove the self-locking hexagonal nut (71), lockwasher (72), two electrical terminals (73 and 74), lockwasher (75), machine screw (76), and lockwasher (77) that hold the left side of the socket plate (82) to the main base (127).

(3) Remove the machine screw (78) and lockwasher (79) that hold the other side of the socket plate (82) to the main base (127).

(4) Disconnect the electrical leads from the receptacle connector (81); remove the nut (80) that holds the receptacle connector to the socket plate (82); remove the receptacle connector.

(5) Remove the four machine screws (86) and lockwashers (87) that hold the electrical connector shell (88) to the main base (127); disconnect the electrical leads and remove the electrical connector shell.

(6) Remove the four machine screws (89) and lockwashers (90) that hold the mounting plate (92) to the main base (127); remove the cable from the bushing insulator (91) and remove the bushing insulator from the mounting plate.

(7) Remove the four machine screws (93) and lockwashers (94) that hold the mounting

plate (96) to the main base (127); remove the cable from the bushing insulator (95) and remove the bushing insulator from the mounting plate.

b. Replacement.

(1) Install the cable in the bushing insulator (95). Install the bushing insulator on the mounting plate (96). Position the mounting plate on the main base (127); secure with four machine screws (93) and lockwashers (94).

(2) Install the cable in the bushing insulator (91). Install the bushing insulator on the mounting plate (92). Position the mounting plate on the main base (127); secure with four machine screws (89) and lockwashers (90).

(3) Position the electrical connector shell (88) on the main base (127); secure with four machine screws (86) and lockwashers (87). Connect the electrical leads to the electrical shell connector.

(4) Position the receptacle connector (81) on the socket plate (82); secure with a nut (80); solder the electrical leads to the receptacle connector.

(5) Position the socket plate (82) on the main base (127); secure the right side of the socket plate with a machine screw (78) and lockwasher (79).

(6) Secure the other side of the socket plate (82) to the main base (127) with a machine screw (76), lockwasher (77), lockwasher (75), two electrical terminals (74 and 73), lockwasher (72), and self-locking hexagonal nut (71).

(7) Install the base plate (2) on the main base (127) as described in paragraph 289*b*(6).

294. Removal and Replacement of Perforator Base Electrical Components

(fig. 290)

The electrical components mounted in the perforator base are illustrated in figure 290. These components should not be removed unless they are damaged or inoperative. Part numbers for replacement parts are shown in the legend which accompanies the illustration.

Section VII. PAGE PRINTER ADJUSTMENT PROCEDURES

295. General

This section contains the requirements and adjustment procedures for the page printer. Adjustments are arranged in the proper sequence for a complete readjustment of the page printer. When making individual adjustments, check, and if necessary, perform all related adjustments. When removing items to make an adjustment refer to section V for removal and replacement instructions. Perform adjustments described in paragraphs 296 through 324 in that order.

296. Y-Letter Spacing Collar Adjustment

(fig. 291)

a. Requirement. The clearance between the spacing collar and the flat washer should be .002- to .005-inch.

b. Method of Checking. Place the gage between the spacing collar and the flat washer.

c. Adjustment. Loosen the set screws in the spacing collar and move the spacing collar in or out to meet the requirement; tighten the setscrews.

297. Selector Lever Clearance Adjustment

(fig. 292)

a. Requirement. There should be .002- to .005-inch clearance between the stop lever spacer and the first selector lever.

b. Method of Checking. Remove the terminal box as described in paragraph 222 and the transfer lever spring. Check the clearance with a flat feeler gage.

c. Adjustment. Loosen the set screw and slide the post in or out to meet the requirement; tighten the set screw. Replace the terminal box and transfer lever spring.

298. Rangefinder Dial Assembly Adjustment

(fig. 293)

a. Requirement.

(1) When the rangefinder dial is set at 60, the lower end of the orientation lever should be midway between the high and low points of the rangefinding cam, as shown in figure 293.

(2) There should be a .010- to .020 inch clearance between the rangefinder dial and the selector lever comb bracket.

(3) The detent should be set so that the detent holds the rangefinder dial firmly without excessive tightness.

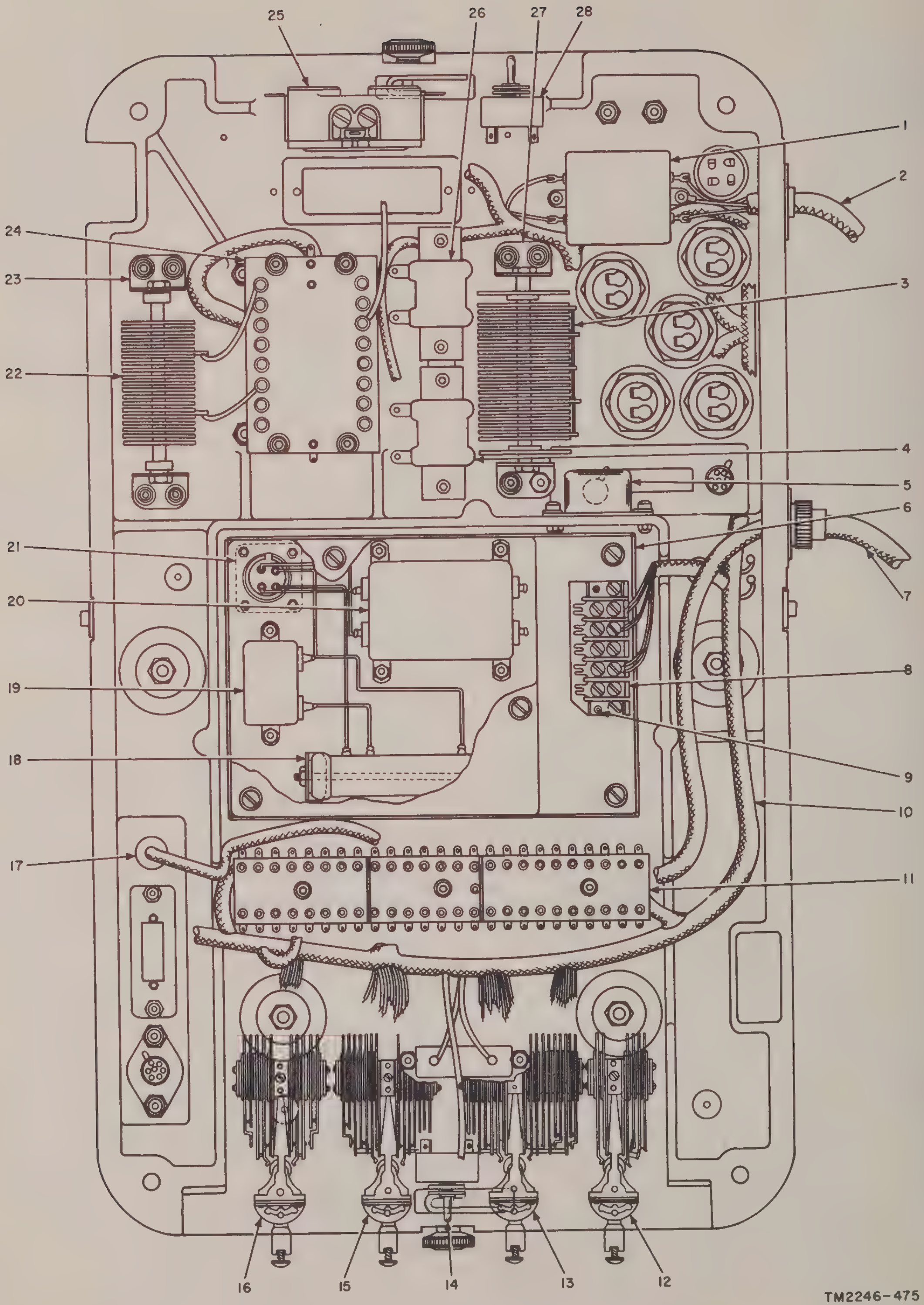


Figure 290. Perforator base electrical components.

b. Adjustment.

(1) Loose the set screw in the rangefinding cam. Rotate the rangefinding cam to meet the requirement. Tighten the set screw.

(2) Without rotating the rangefinding cam, hold it tight against the spacer. Set the .010 to .020 gap by sliding the rangefinder dial axially. Tighten the setscrew in the rangefinding cam.

(3) Loosen the set screw holding the detent. Slide the detent against the rangefinder dial to obtain the required detent action. Tighten the set screw holding the detent.

(4) Check the related adjustment described in paragraph 299.

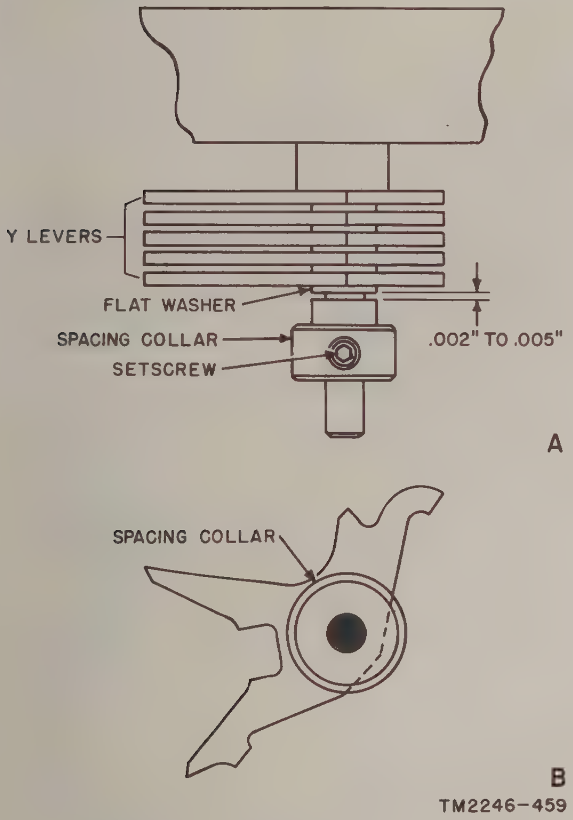


Figure 291. Y-lever spacing collar adjustment.

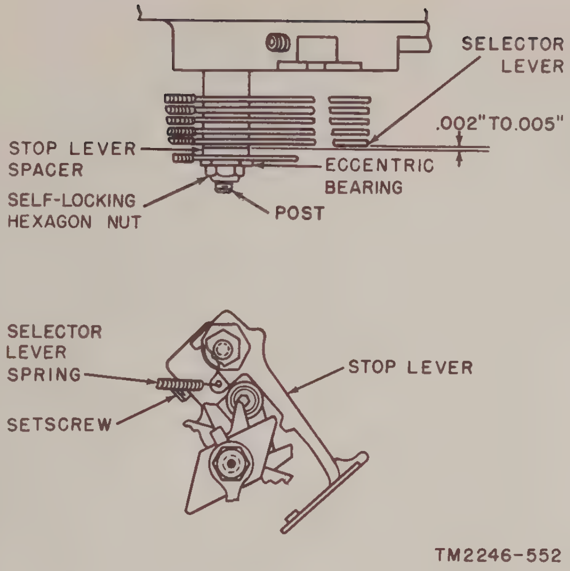


Figure 292. Selector lever clearance adjustment.

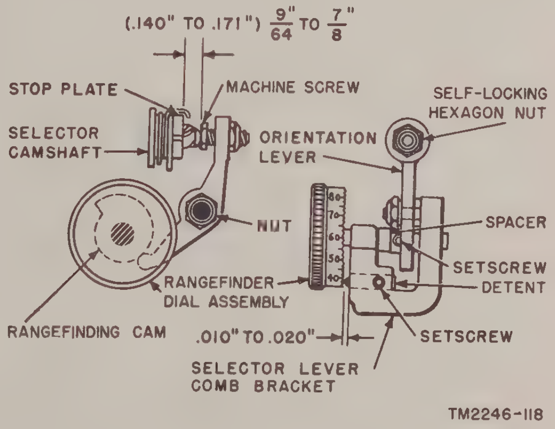


Figure 293. Rangefinder dial assembly.

1 Ac line filter Z7
2 Power cable assembly P10
3 Metallic rectifier CR3
4 Fixed resistor R11
Fixed resistor R15
Fixed resistor R23
5 Fixed capacitor C21
6 Filter box assembly, 56035A
7 Cable assembly P9
8 Terminal board TB7
9 Terminal board mounting plate, 20382
10 Cable assembly, 54185
11 Terminal Board TB6
12 Keyboard control switch S23
13 Perforator control switch S31
14 MOTOR switch S22
15 Line switch key S28
16 ALR MONITOR switch S24
17 Bushing insulator, 20713
18 Fixed resistor R12
19 Fixed capacitor C10
20 Filter Z8
21 Receptacle connector J11
22 Metallic rectifier CR4
23 Metallic rectifier bracket 56101
24 Terminal board assembly TB8
25 Receptacle connector J16
26 Fixed resistor R14
Fixed resistor R13
27 Metallic rectifier bracket 56101
28 POWER switch S21

Figure 290—Continued.

299. Orientation Lever Adjustment

(fig. 293)

a. Requirement. There should be a .140- to .171-inch clearance between the stop plate and the head of the machine screw in the orientation lever when the orientation lever is held against the midpoint of the rangefinding cam.

b. Adjustment. Loosen the self-locking hexagonal nut of the machine screw and turn the machine screw in or out to meet the requirement. Tighten the self-locking hexagonal nut. Check the related adjustment described in paragraph 298.

300. Selector Lever Guide Comb Adjustment

(fig. 294)

a. Requirement. The selector levers and Y-levers should be aligned and there should be no bind between the selector levers and the selector lever guide comb.

b. Adjustment.

(1) With an L Allen wrench, loosen the selector lever guide comb mounting screws and position the selector lever guide comb slots parallel to a side of the selector levers. Slide each selector lever up and down in its slot to check for bind. Tighten mounting screws and recheck for binds.

(2) Loosen the two selector lever guide comb mounting screws and position the selector lever guide comb to meet the requirement. Tighten the mounting screws. Recheck, and readjust if necessary. Check related adjustments described in paragraphs 322, 323, and 324.

301. Code Ring End Play Adjustment

(fig. 295)

a. Requirement. The clearance between the ball retainer and the code ring collar should be .002- to .004-inch.

b. Method of checking. Check the clearance by inserting a flat feeler gage from the bottom of the code ring cage between a code ring and a ball of the ball retainer.

c. Adjustment. Insert an Allen wrench through the top stop bars, through the hole in the code cage spacer into a set screw in the code ring collar. Loosen the set screws and move the code ring collar toward or away from the code ring to meet the requirement. Tighten the set screws in the code ring collar and recheck the requirement. Recheck related adjustments described in paragraphs 307, 308, 316, 330, 331, and 332.

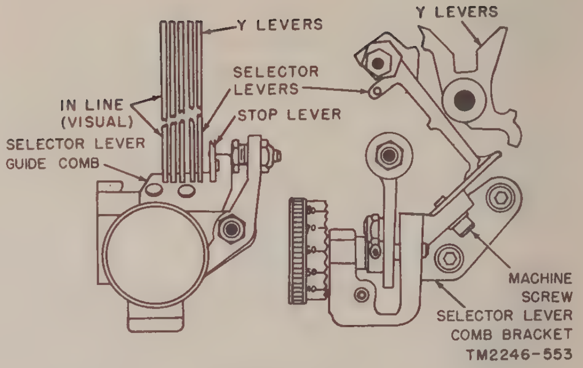


Figure 294. Selector lever guide comb adjustment.

302. Sensing Levers End Play Adjustment

(fig. 296)

a. Requirement. There should be .001- to .005-inch clearance between the flat washer and the line feed sensing lever.

b. Method of Checking. Check the clearance by inserting a flat feeler gage from the rear of the code ring cage between the line feed sensing lever and the flat washer.

c. Adjustment. Remove the code-ring cage as described in paragraph 199 and peel the necessary laminations from the tolerance take-up flat washer. Reassemble, recheck, and remove additional laminations if necessary. Check related adjustments described in paragraphs 302 through 324.

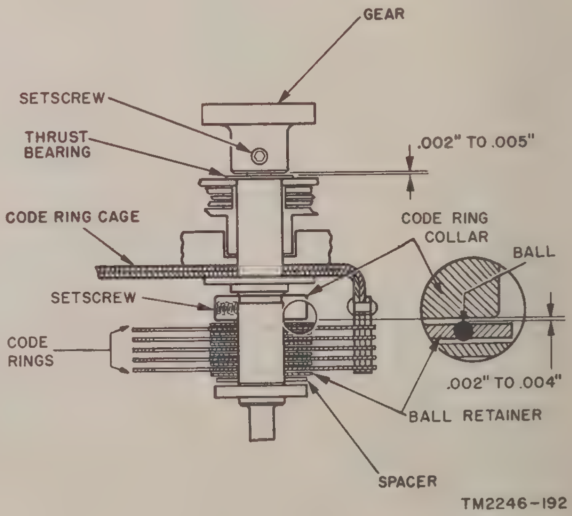


Figure 295. Code ring end play adjustment.

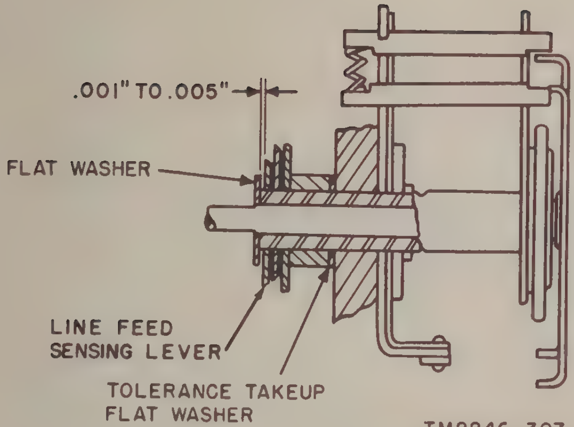


Figure 296. Sensing levers end play adjustment.

303. Square Shaft and Function Selecting Arm Claw Adjustment

(fig. 297)

a. Requirement. There should be a .015- to .046-inch clearance between the function selecting arm claw and the casting, and a .005- to .010-inch clearance between the flat washer and the end of the square shaft.

b. Method of Checking. Loosen the four set screws of the square shaft driven gear and slide the square shaft driven gear toward the motor side of the unit. Check both clearances with feeler gages.

c. Adjustment. Loosen the clamping screw on the function selecting arm claw. Place a .030-inch feeler gage between the function selecting arm claw and the casting. Hold the function selecting arm claw against the feeler gage, and move the square shaft toward the code-ring cage to obtain the required clearance between the square shaft and the flat washer. Tighten the clamping screw on the function selecting arm claw. Leave the feeler gage between the function selecting arm claw and the casting for the next adjustment (par. 304).

304. Square Shaft Driven Gear Adjustment

(fig. 298)

a. Requirement. With the .030-inch feeler gage between the function selecting arm claw and the casting (par. 297), there should be .002- to .005-inch clearance between the square shaft driven gear and the flat washer.

b. Adjustment. Loosen four setscrews on the square shaft driven gear. With a .030-inch feeler gage between the function selecting arm claw and the casting, slide the square shaft driven gear to get the required clearance between the square shaft driven gear and the flat washer. Tighten the four setscrews. Check related adjustments described in paragraphs 302 and 303.

305. Line Feed and Platen Shift Sensing Cams Alinement

(fig. 299)

a. Requirement. The sensing levers must be in line with their respective cams of the line feed and platen shift sensing cam.

b. Adjustment. Remove the assembled function shaft from the machine and remove the machine screw from the end of the function shaft. Remove the parts from the end of the function shaft until the laminated washer is removed. Peel the laminated washer to meet the requirement, and replace the parts on the function shaft. Tighten the machine screw and install the assem-

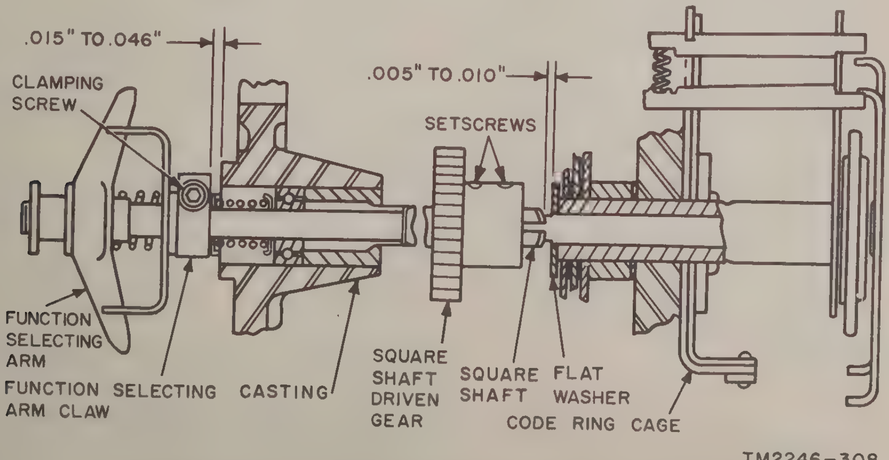


Figure 297. Square shaft and function selecting arm claw adjustment.

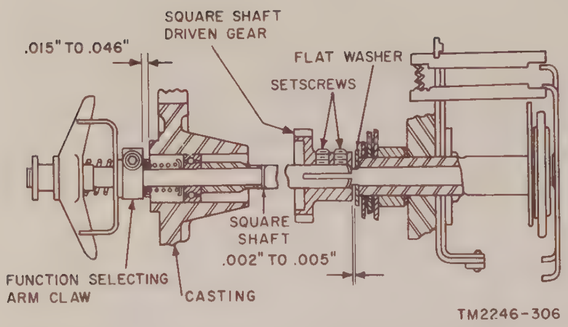


Figure 298. Square shaft driven gear adjustment.

bled function shaft in the page printer. Recheck the requirement and readjust if necessary. Check related adjustments described in paragraphs 302, 303, and 304.

306. Cam Followers and Spacing Collar Adjustment

(fig. 300)

a. Requirement. There should be equal clearance between the rollers of the line feed and platen shift cam followers and their respective cams.

b. Method of Checking. With a code combination other than line feed or figures shift selected, remove the terminal box and the paper roller stand as described in paragraph 222. Check the adjustment and replace the removed items.

c. Adjustment. Loosen the set screws in the spacing collar and shift the spacing collar right or left until the requirement is met. Tighten the set screws. Check related adjustments described in paragraphs 302, 303, 304, and 305.

307. Code-Ring Cage Adjustment

a. Requirement. There should be a .010- to .020-inch clearance between the function sensing levers and their corresponding function stop bars (B, fig. 301) when the page printer is in the stopped position.

b. Adjustment. Loosen the machine screws mounting the code ring cage (fig. 305) and turn the code-ring cage either clockwise or counterclockwise until the requirement is met. Tighten the machine screws.

308. Code Ring Locking Bail Cam Follower Adjustment

(fig. 302)

a. Requirement. The locking bail collar blade should operate directly between the letters and J stop bars without touching either stop bar.

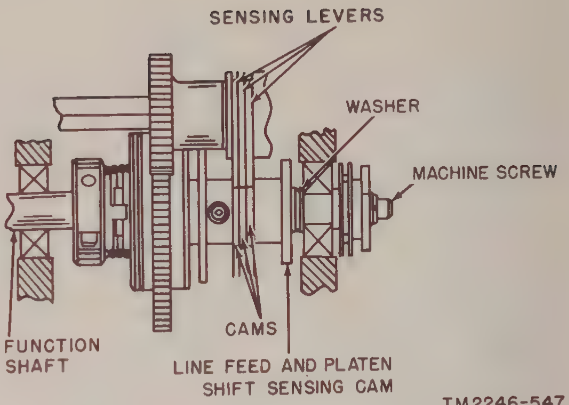


Figure 299. Line feed and platen shift sensing cam alinement.

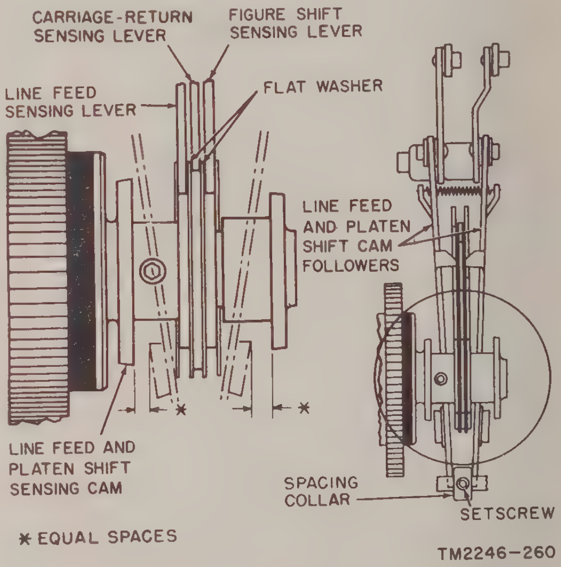
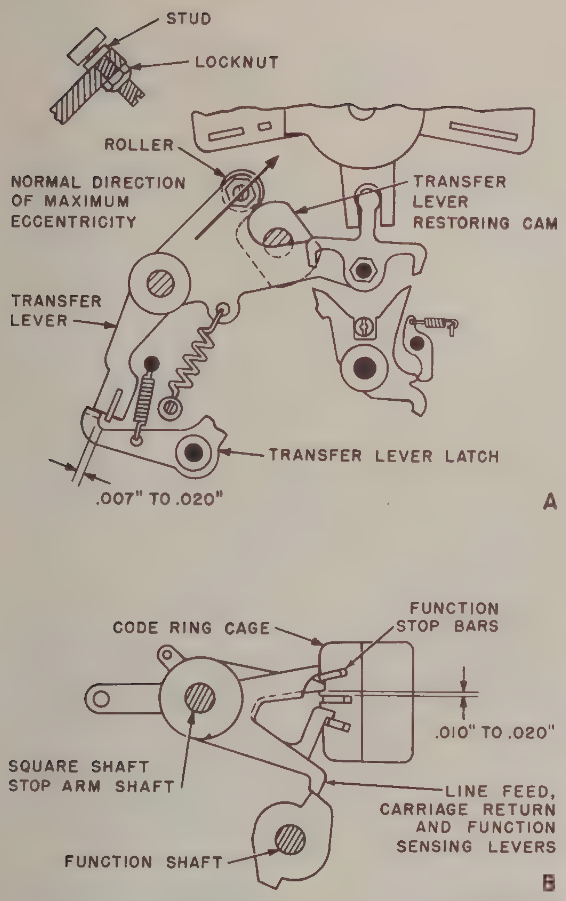

CARRIAGE-RETURN SENSING LEVER
FIGURE SHIFT SENSING LEVER
LINE FEED SENSING LEVER
FLAT WASHER
LINE FEED AND PLATEN SHIFT CAM FOLLOWERS
LINE FEED AND PLATEN SHIFT SENSING CAM
SPACING COLLAR
SETSCREW
* EQUAL SPACES
TM2246-260

Figure 300. Cam followers and spacing collar adjustment.

b. Adjustment. With the function shaft in the position shown in figure 302, loosen the mounting screw holding the cam follower. Position the cam follower until the locking bail collar blade is directly between the letters and the J stop bars and tighten the mounting screw. Set up repeated letters and J code groups on the code rings and check the requirement by eye. Readjust, if necessary. Check related adjustments described in paragraphs 301 and 307.

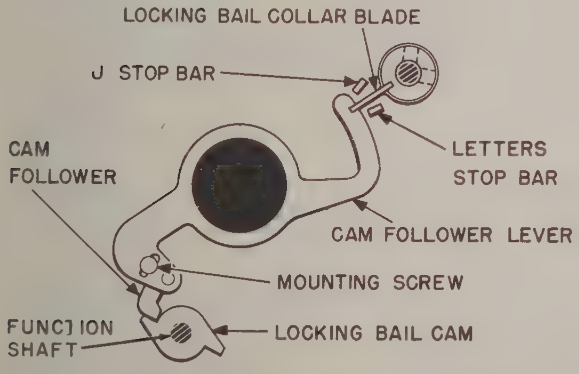
309. Transfer Lever Roller Stud Adjustment

a. Requirement. There should be a .007- to .020-inch clearance between the transfer lever and the latching surface of the transfer lever latch when the roller of the transfer lever is on a high


STUD
LOCKNUT
ROLLER
NORMAL DIRECTION OF MAXIMUM ECCENTRICITY
TRANSFER LEVER RESTORING CAM
TRANSFER LEVER
TRANSFER LEVER LATCH
.007" TO .020"
A
CODE RING CAGE
FUNCTION STOP BARS
.010" TO .020"
SQUARE SHAFT STOP ARM SHAFT
LINE FEED, CARRIAGE RETURN AND FUNCTION SENSING LEVERS
FUNCTION SHAFT
B

TM2246-145

Figure 301. Transfer lever roller stud and code-ring cage adjustments.



TM2246-103

Figure 302. Code-ring locking bail cam follower adjustment.

portion of the transfer lever restoring cam (A, fig. 301).

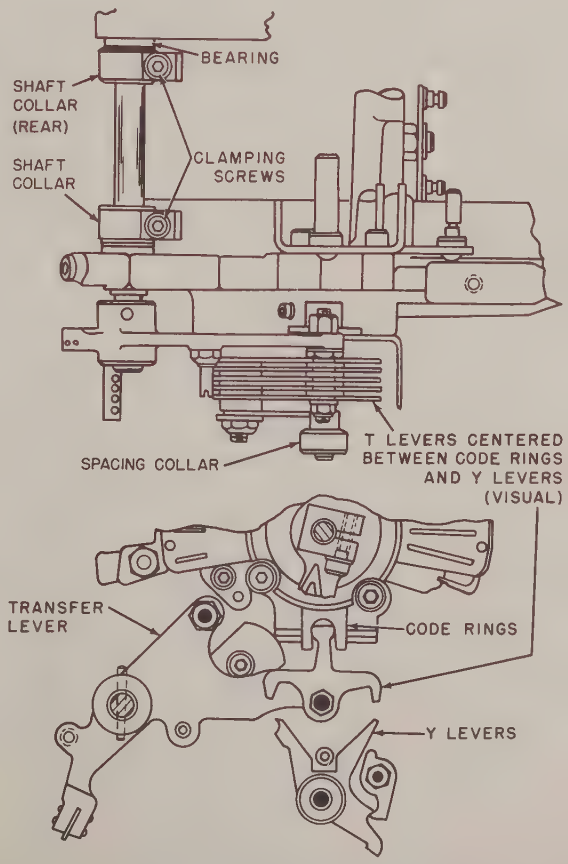
b. Adjustment. Loosen the locknut and set the stud for maximum eccentricity. Rotate the motor of the page printer by hand until the roller is on the high portion of the transfer lever restoring cam. Turn the stud in counterclockwise direction until the required clearance is obtained, and tighten the locknut. Check related adjustments described in paragraphs 310 and 311.

310. T-Levers Alinement

(fig. 303)

a. Requirement. The T-levers must be in line with their associated Y-levers and code rings. Any offset should be equally divided so that the T-levers are centered between the Y-levers and the code rings.

b. Adjustment. With the rear collar of the transfer lever shaft loose, loosen the clamping screw of the front collar and slide the transfer lever in or out to meet the requirement. While holding the transfer lever in position, slide the rear collar tight against the bearing and tighten the clamping screw. Check related adjustments described in paragraphs 309 and 311.



TM2246-554

Figure 303. T-levers alignment.

311. Transfer Lever Shaft End Play Adjustment

(fig. 304)

a. Requirement. There should be a .002- to .005-inch clearance between the rear collar on the transfer lever shaft and the frame.

b. Adjustment. Loosen the clamping screw and hold the front collar tight against the frame. Move the transfer lever shaft to meet the requirement and tighten the clamping screw. Check related adjustments described in paragraphs 309 and 310.

312. Y-Lever Eccentric Stop Preliminary Adjustment

(fig. 305)

a. Requirement. The Y-lever eccentric stop should be positioned midway between the Y-levers.

Note. When making the following adjustment, be careful not to damage the function shaft when inserting tool into the setscrew.

b. Adjustment. Set the Y-levers for either the R-or Y-code combination. Loosen the setscrew which locks the Y-lever eccentric stop. Turn the stop clockwise until it makes contact with the Y-levers that are in the space position, and note the position of the slot in the end of the stop. Then turn the stop counterclockwise until it makes contact with the Y-levers that are in the mark position, and note the position of the slot in the end of the stop. Turn the stop to a position midway between the two noted positions and tighten the holding setscrew.

313. T-Lever Pivot Stud Adjustment

(fig. 306)

a. Requirement. The T-levers should engage the Y-levers an equal amount for both mark and space positions of the Y-levers.

b. Method of Checking. With the transfer lever latched and the function shaft in the stopped position, set the number 1 Y-lever in a mark position. Then trip the transfer lever by pulling the latch down causing the T-levers to engage the Y-levers. Check the amount of engagement by eye. Reposition the transfer lever and the T-levers by rotating the motor by hand. Set the number 1 Y-lever in a space position, trip the transfer lever, and check the amount of engagement by eye.

c. Adjustment. Loosen the self-locking hexagonal nut on the rear of the T-lever pivot stud. Position the pivot stud until the requirement is met and tighten the nut. Note the normal direction of maximum eccentricity. Check related adjustments described in paragraphs 312, 314, and 315.

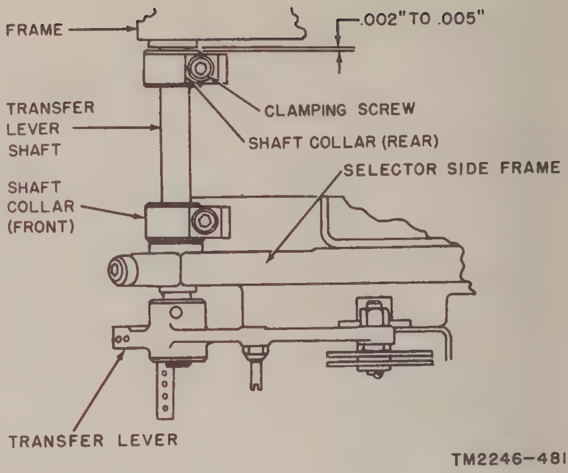


Figure 304. Transfer lever shaft end play adjustment.

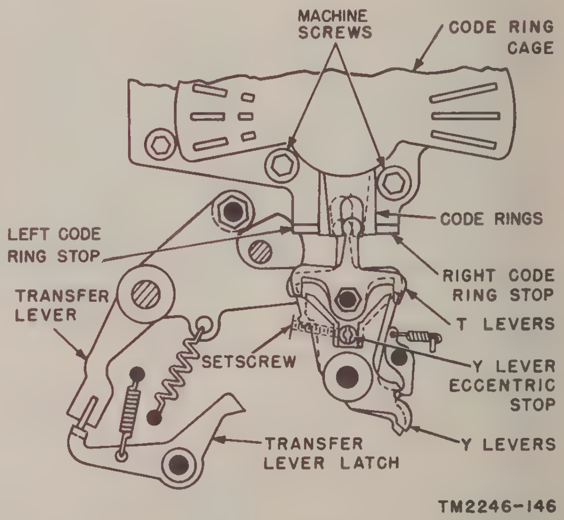


Figure 305. Y-lever eccentric stop preliminary adjustment.

314. Y-Levers Detent End Play Adjustment

(fig. 307.)

a. Requirement. There should be .002- to .005-inch clearance between the centering sleeve and the detent spacer.

b. Adjustment. With Y-lever detents and detent spacers on the centering sleeve and the centering sleeve on the Y-lever detent post, tighten the plain hexagonal nut and check the clearance between the detent spacer and the centering sleeve.

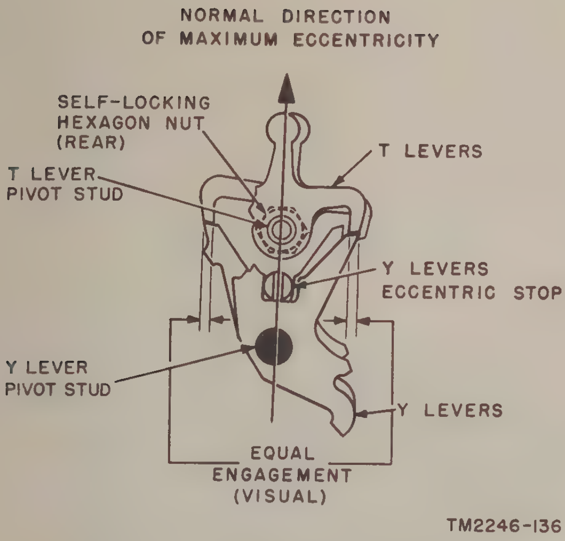


Figure 306. T-*lever pivot stud aajustment.*

If the clearance is not within the requirement, remove the plain hexagonal nut and lock washer, slide the centering sleeve from the Y-lever detent post, and peel the laminated spacer to meet the requirement.

Note. The spacer adjacent to the laminated spacer may have to be replaced by five laminated spacers to attain the requirement.

315. Y-Lever Detents and Y-Levers Adjustment

(fig. 308)

a. Requirements.

(1) There should be an equal engagement of the Y-lever detent with the Y-lever when the Y-lever is in either the mark or space position.

(2) It should require 30 to 60 grams pull to start a Y-lever moving.

b. Adjustment. Loosen the plain hexagonal nut and turn the centering sleeve until both requirements are met; tighten the plain hexagonal nut (fig. 307).

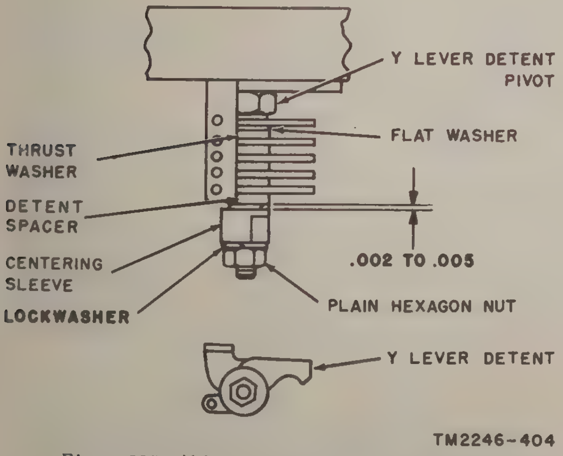


Figure 307. Y-*levers detent end play adjusıment.*

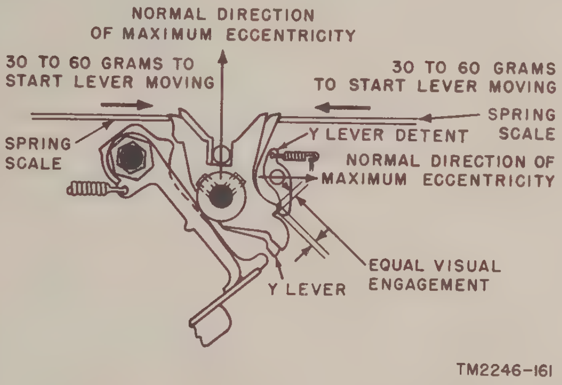


Figure 308. Y-*levers detent and* Y-*levers adjustment.*

316. Stop Bar Adjustable Fulcrum Adjustment

(fig. 309)

a. Requirement. There should be .010- to .015-inch clearance between the selected function stop bar and the function sensing lever when the sensing lever has dropped and is level with its associated stop bar.

b. Adjustment. Select figures, then turn the motor by hand until the figures shift sensing lever is in line with the figures stop bar. Loosen the machine screw holding the figures shift adjustable fulcrum. Loosen the self-locking hexagonal nut holding the eccentric stud. Turn the eccentric stud with a screw driver until the requirement is met. Hold the eccentric and tighten the self-locking nut. Tighten the machine screw. Recheck the clearance. Use the same procedure for carriage return and line feed adjustment. Related adjustments paragraphs 301, 302, 308, 309, 316, 330, 331, and 332.

Note. The selector magnet should be disassembled to proceed with the following adjustments. Assemble only as needed.

317. Armature and Selector-Magnet Bracket Alinement

(fig. 310)

a. Requirement. The magnet bracket must be positioned on the page printer casting so the larger

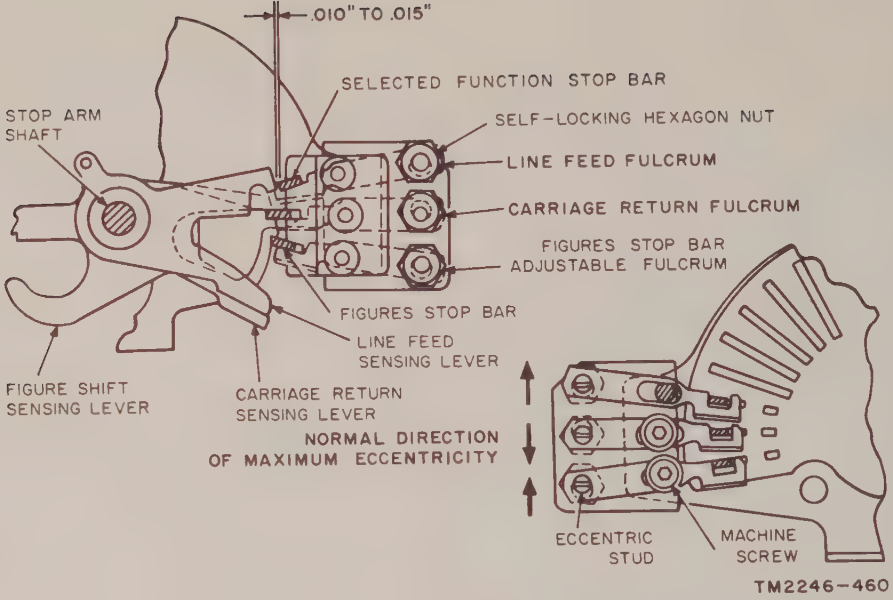


Figure 309. Stop bar adjustable fulcrum adjustment.

holes in selector magnet bracket and mounting holes in the casting are alined. Armature position must permit number 1 selector lever to just pass knife edge of armature blade.

b. Adjustment. Position selector-magnet bracket on the page printer casting so holes in the casting are virtually centered with the larger holes in the magnet bracket. Hold the selector-magnet bracket against the selector-magnet bracket adjusting screws and position the adjusting screws in or out to meet the requirement. Adjust the armature with armature adjusting screws until number 1 selector lever will just pass the knife edge of the armature when the selector levers are manually moved toward the knife edge. Either adjusting screw can be used by holding the armature against the screw and screwing in or out until the requirement has been obtained. Remove the magnet bracket from the selector casing and position the other adjusting screw until only barely perceptible amount of movement remains between the adjusting screw and the armature. This procedure will avoid bending the armature from overtightening an adjusting screw.

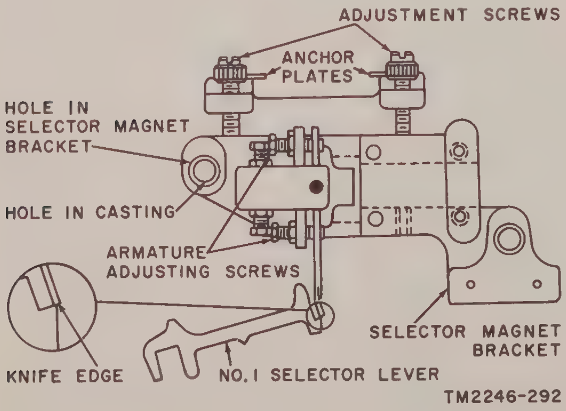


Figure 310. Armature and selector-magnet bracket alinement.

Note. The selector magnet must be removed for adjustments described in paragraphs 318 through 321.

318. Armature Stop Bracket and Bar Magnet Preliminary Clearance

(fig. 311)

a. Requirement. There must be a gap of .015-inch between the south pole of the bar magnet and the armature stop bracket.

b. Adjustment. Assemble the bar magnet on the selector-magnet bracket so that the requirement is met. Tighten the set screw. The north pole of the bar magnet is designated by a red dot on the side of the bar magnet. Check related adjustments 317 through 321.

319. Selector Magnet Pole Faces and Armature Alignment

(fig. 312)

a. Requirement. There should be a gap of .004 inch between the pole faces of the selector-magnet core and the toffets on the armature.

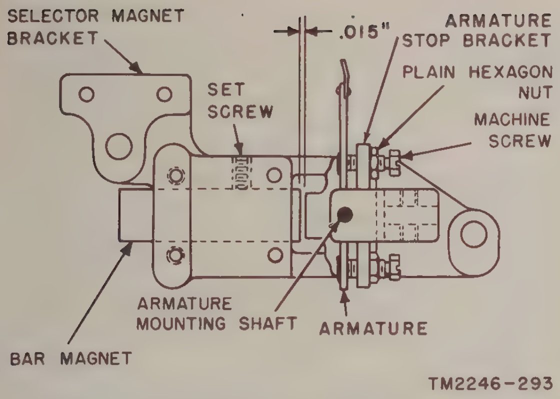


Figure 311. Armature stop bracket and bar magnet preliminary clearance.

b. Adjustment. Mount the magnet conductor bracket and the selector-magnet coils on the selector-magnet bracket by the machine screw selector-magnet cable stud. A friction tightens on the mounting and will allow the selector magnet coils to be positioned. Use two .004-inch gages, one between either side of the pole face and armature toffets. Make sure the .004-inch clearances are equal and that the surfaces on the armature toffets and the pole faces are parallel to each other within .002 inch. Use the setscrews located underneath the selector magnet coils to adjust to the latter requirement. Remove the lock setscrews and position the adjusting setscrews in or out to meet the requirement. Replace the lock setscrews. Back out the armature adjusting screw so that the armature in either the mark or space position does not touch adjusting screws. Check related adjustments, paragraphs 317 through 323.

320. Bar Magnet Attractive Force and Armature Clearance Adjustment

(fig. 313)

a. Requirement. A pull from 40 to 75 grams should be exerted by the permanent magnet on the armature.

b. Method of Checking. With the selector-magnet coil not energized, use a spring scale to measure the pull required to start the armature blade moving in each direction. Pull toward the magnet coil assem-

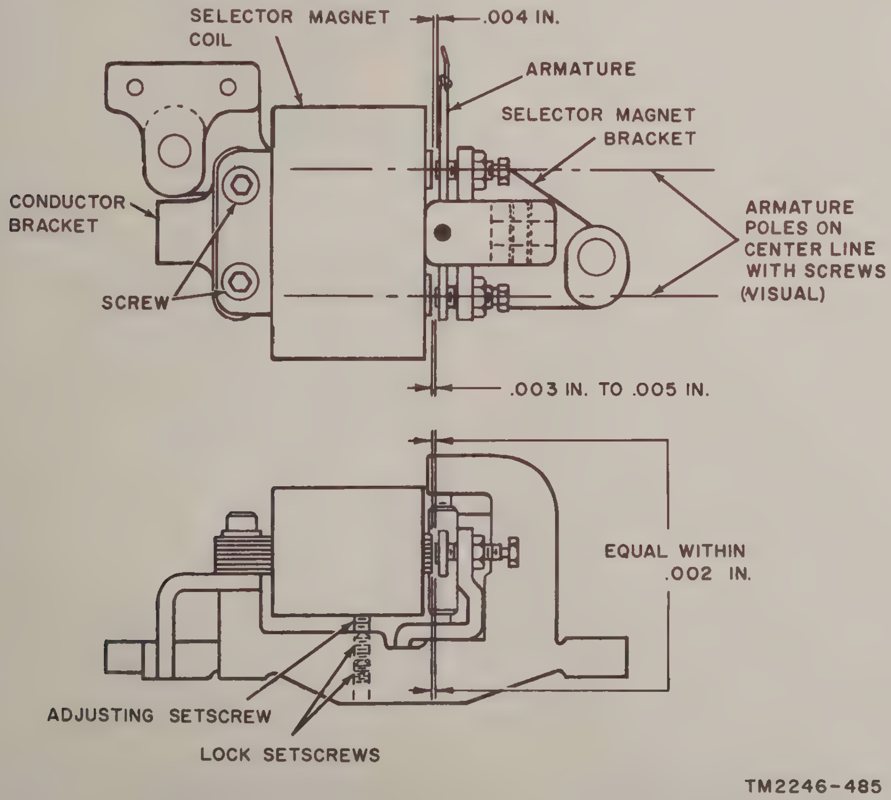
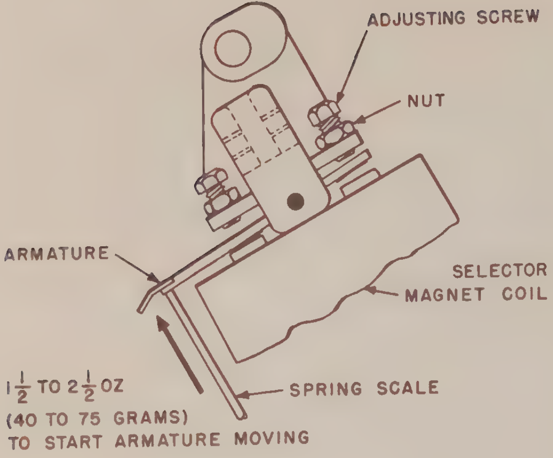
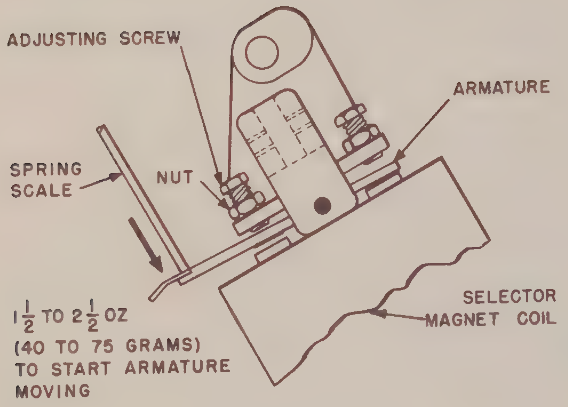


Figure 312. Selector-magnet pole faces and armature alignment.



A. ARMATURE IN SPACE POSITION



B. ARMATURE IN MARK POSITION

TM2246-137

Figure 313. Bar magnet attractive force and armature clearance adjustment.

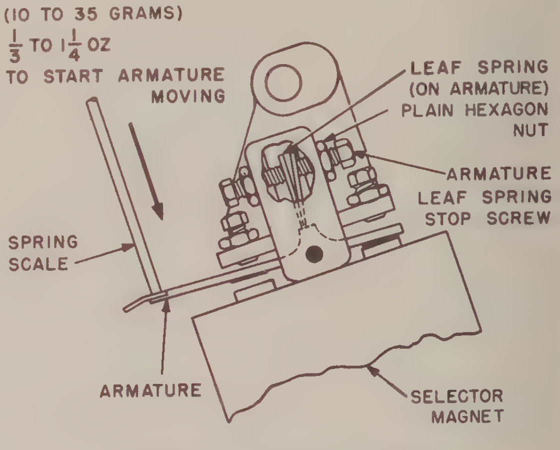
bly in the space position, pull away from the magnet coil assembly in the mark position.

c. Adjustment. Place .004-inch feeler gages between the pole faces of the core and the toffets on the armature. Set the adjusting screws back down on the armature blade, making sure that screws are not too tight or they will bend the blade. Loosen the selector magnet coil mounting screws and bar magnet setscrew. Close or open the gap at the south pole of the bar magnet to obtain the requirement. Perform the adjustment as outlined in paragraph 319 and recheck the requirement in *a* above.

321. Bar Magnet Attractive Force and Leaf Spring Adjustment

(figs. 314 and 315)

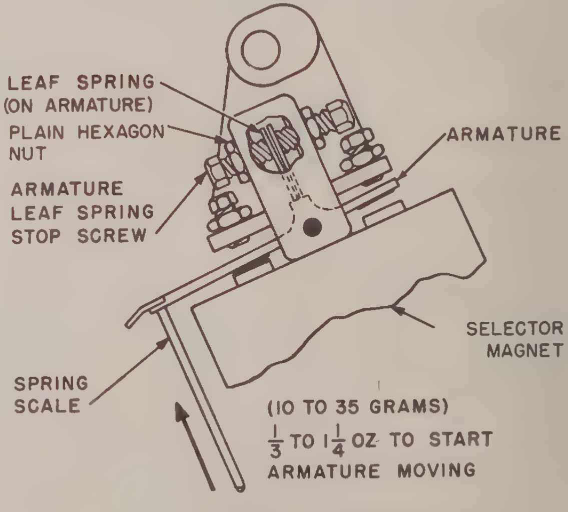
a. Requirement. The pressure required to move the armature to the mark or space positions should be within 10 grams of each other, and both should fall between 10 and 35 grams.



ARMATURE IN MARK POSITION

TM2246-148

Figure 314. Bar magnet attractive force and leaf spring adjustment, armature in mark position.


LEAF SPRING (ON ARMATURE)
PLAIN HEXAGON NUT
ARMATURE LEAF SPRING STOP SCREW
ARMATURE
SELECTOR MAGNET
SPRING SCALE
(10 TO 35 GRAMS)
1/3 TO 1 1/4 OZ TO START ARMATURE MOVING

ARMATURE IN SPACE POSITION

TM2246-150

Figure 315. Bar magnet attractive force and leaf spring adjustment, armature in space position.

b. Method of Checking. The magnet assembly should be mounted to the selector casting. Use the spring scale against armature blade.

c. Adjustment. Position the armature leaf spring stop screws until the requirement is met.

322. Selector and Stop Levers Alinement with Armature Blade (Preliminary)

(fig. 316)

a. Requirement. With a .004-inch clearance between the magnet pole faces and the armature toffets, selector levers should just pass the knife edge of the armature blade.

b. Adjustment. Place .004-inch feeler gages between the pole faces and the armature toffets. Place the selector magnet on the unit and replace the selector-magnet bracket mounting screws to exert friction to hold the selector-magnet bracket to the casting. While manually moving the selector lever past the knife edge of the armature blade, position the selector-magnet bracket adjusting screws until the requirement is met. Tighten the selector-magnet bracket mounting screws. Loosen the self-locking hexagonal nut on the end of the selector lever pivot stud and turn the stop lever eccentric bearing until the stop lever just engages the knife edge of the armature. Tighten the self-locking hexagonal nut while holding the eccentric bearing stationary. (Check related adjustments in paragraphs 317, 319, 320, 321, and 324.)

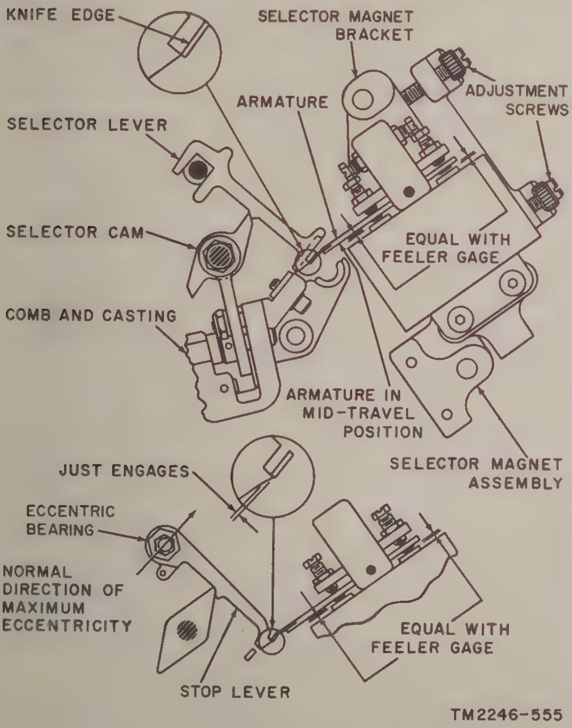


Figure 316. Selector stop levers alignment with selector magnet (Preliminary).

323. Selector-Magnet Alinement with Selector and Y-Levers

(fig. 317)

Note. This adjustment is to be made after adjustment in paragraph 322.

a. Requirement. Selector camshaft should not rotate with a .006-inch feeler gage between the Y lever and the left side of Y-lever eccentric stop when the letters code group is received by the selector mechanism and the motor is running. The selector camshaft should rotate when a .002-inch feeler gage is inserted at that position.

b. Adjustment. Adjust the magnet bracket adjusting screws until the above requirement is met.

324. Selector-Magnet Armature Blade and Selector Lever Clearance

(fig. 318)

a. Requirement. The gap between the armature blade and the selector levers should be between .015- and .020-inch.

b. Adjustment. Position the selector lever comb bracket vertically so the the requirement is met.

325. Function Shaft Clutch Clearance Adjustment

(fig. 319)

a. Requirement. There should be .010- to .020-inch clearance between the function shaft sliding clutch drum and the clutch teeth of the function driven gear when the function clutch latch engages the function shaft sliding clutch drum.

b. Adjustment. Loosen the clamping screw in the shaft collar next to the function clutch latch. Shift the position of the clutch latch along the transfer lever shaft until the requirement is met, and tighten only the clamping screw in the shaft collar to hold the function clutch latch in that position. Make the function shaft clutch latch adjustment (par. 326).

326. Function Clutch Latch Adjustment

(fig. 320)

a. Requirement. There should be .008- to .012-inch clearance between the function clutch latch

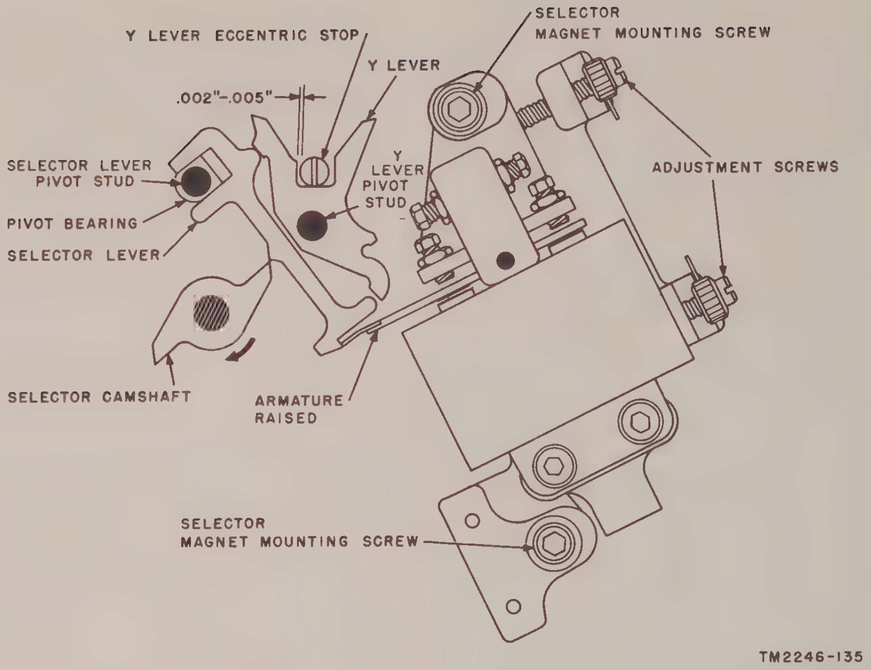


Figure 317. Selector-magnet alignment with selector and Y levers.

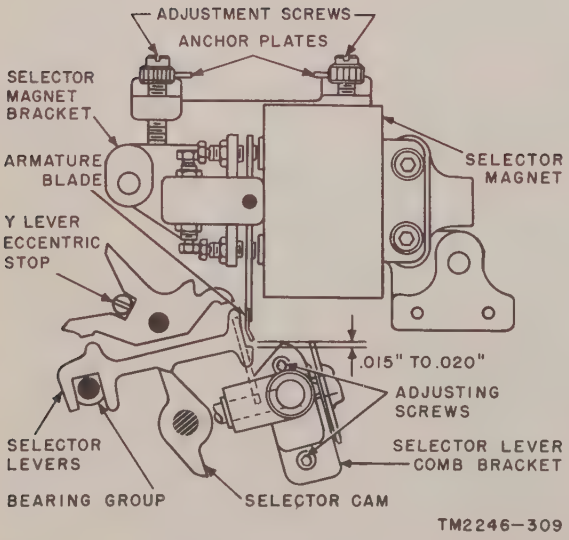


Figure 318. Selector magnet armature blade and selector lever clearance.

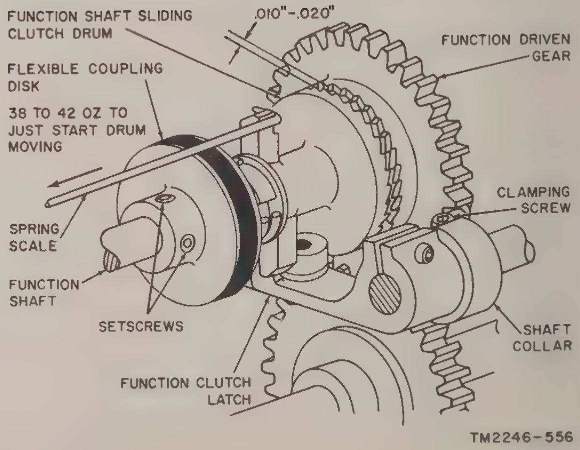


Figure 319. Function shaft clutch clearance, and function shaft cluch tension adjustment.

and the function shaft sliding clutch drum when the clutch is engaged.

b. Method of Checking. With the transfer lever latched and the function shaft in the stopped position, trip the transfer lever by pulling the trip latch down. The function clutch latch then will be disengaged from the sliding clutch drum. Check the requirement with feeler gauge.

c. Adjustment. Loosen the machine screw in the function clutch latch. Position the function clutch latch to meet the requirement; tighten the machine screw (check related adjustments, paragraphs 310, 311, and 325.).

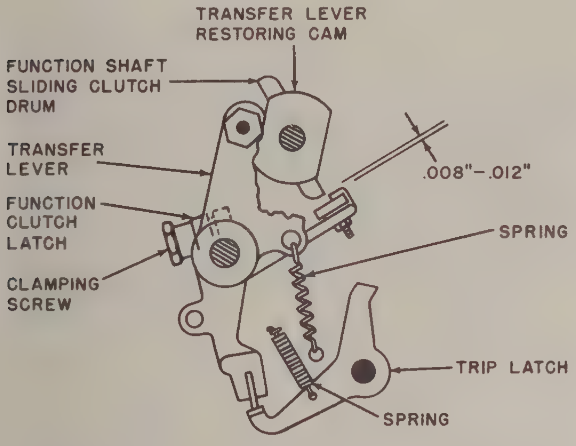


Figure 320. Function shaft clutch latch adjustment.

327. Transfer Lever Spring Adjustment

(fig. 321)

a. Requirement. It should require 4½ to 5½ pounds pull to just start the transfer lever moving when it is in the transferred position.

b. Adjustment. Loosen the socket head screw and turn the spring post eccentric to meet the requirement; tighten the socket head screw.

328. Function Shaft Clutch Tension Adjustment

(fig. 319)

a. Requirement. With the function shaft clutch drum disengaged, by the function clutch latch, it should take a pull of 38 to 42 ounces on a spring scale to just start the function shaft sliding clutch drum moving.

b. Adjustment. Loosen the two setscrews in the flexible coupling disk and shift the flexible coupling disk in the proper direction to obtain the required spring tension; tighten the two setscrews.

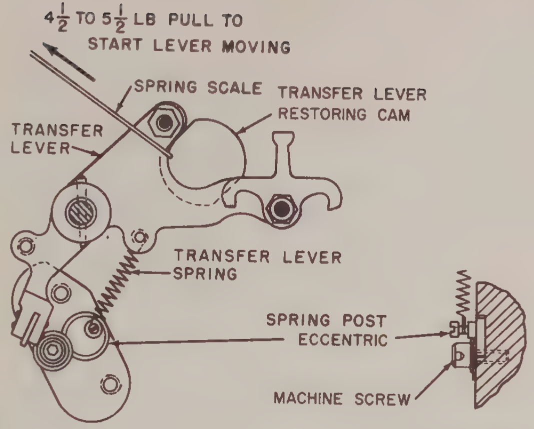


Figure 321. Transfer lever spring adjustment.

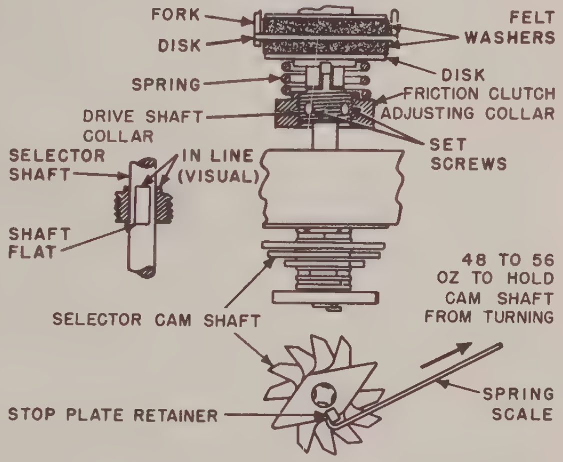


Figure 322. Selector camshaft clutch load adjustment.

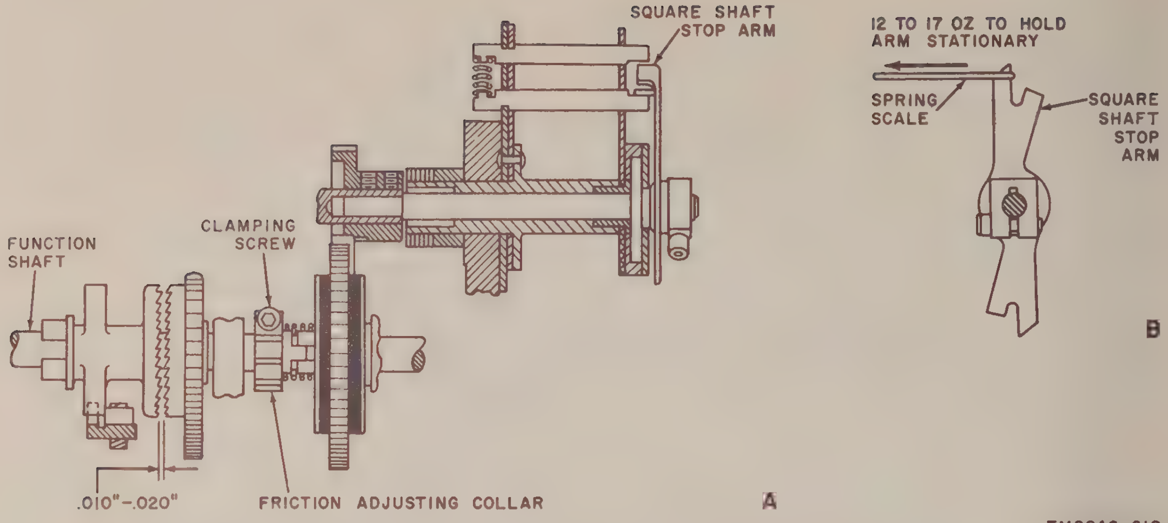
329. Selector Camshaft Clutch Load Adjustment

(fig. 322)

a. Requirement. A pressure of 48 to 56 ounces should be required to start the camshaft rotating.

b. Method of Checking. Place the hook end of the spring scale on the stop plate retainer of the selector camshaft; pull the spring scale in excess of 56 ounces. Move the armature of the selector magnet to the space position, away from stop lever, and decrease the pull on the spring scale until the selector camshaft starts to rotate, read scale.

c. Adjustment. Loosen the clamping screw of the friction clutch adjusting collar and screw the friction clutch adjusting collar on the drive shaft collar to obtain the desired tension. Tighten the clamping screw.



TM2246-619

Figure 323. Square shaft stop arm torque adjustments.

330. Square Shaft Stop Arm Torque Adjustment

(fig. 323)

a. Requirement. With the motor running and the function shaft rotating, a pull of 12 to 17 ounces is required to hold the stop arm stationary.

b. Method of Checking. Place the hook end of the spring scale on an end of the square shaft stop arm and pull to excess of 17 ounces. Receive other than the last code group and decrease the pull on the spring scale until the square shaft stop arm starts to move. Check the reading of the scale.

c. Adjustment. With the motor off, loosen the clamping screw of the friction adjusting collar. Turn the friction adjusting collar in or out to meet the requirement; tighten the clamping screw and recheck the tension.

331. Code Ring Locking Bail Shaft Adjustment

(fig. 324)

a. Requirement. There should be .010- to .020-inch clearance between the code ring locking bail and the code ring projections when the function shaft is in the stopped position.

b. Method of Checking. With the function shaft in the stopped position, place the number 1 code ring so that its projection is directly underneath the locking edge of the code ring locking bail. Check the requirement with a feeler gage.

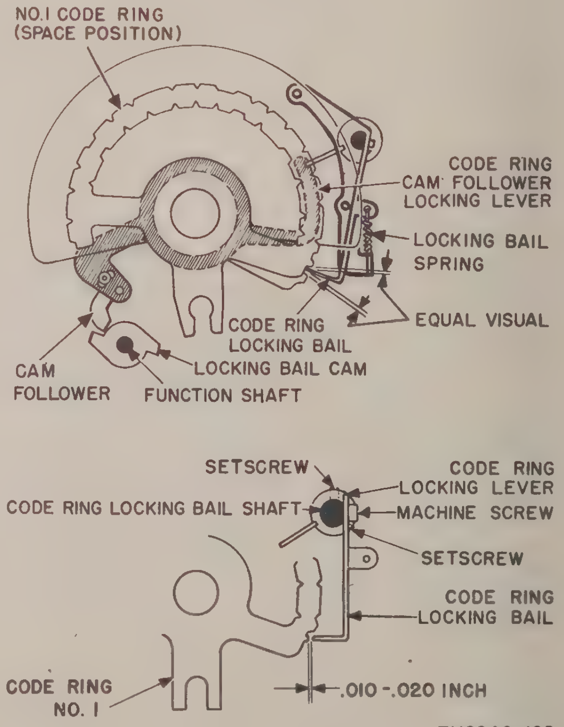
c. Adjustment. Loosen the code ring locking lever setscrews. Rotate the code ring locking bail shaft until the requirement is met; tighten the code ring locking lever setscrews. (Check related adjustments pars. 308 and 322.)

332. Code Ring Locking Bail Adjustment

(fig. 324)

a. Requirement. The code ring locking bail should fully engage the notches in the code rings for both marking and spacing positions in the code rings.

b. Adjustment. Set the Y levers for either R or



TM2246-102

Figure 324. Code ring locking bail and bail shaft adjustments.

Y code combination and trip the transfer lever. Then turn the motor by hand until the locking bail springs pulls the code ring locking bail into the code rings. Loosen the code ring locking bail mounting screws and position the code ring locking bail up or down until it fully engages the notches in the code rings. Tighten the mounting screws (related adjustments, pars. 308 and 331).

333. Type Bar Carriage Positioning Adjustment

(fig. 325)

a. Requirement. There should be 2⁷⁄₁₆ inches between the rear side of the selector stop bar mounting bracket and the center line of the type bar carriage when the type bar carriage is at the left-hand margin.

b. Adjustment. With the type bar carriage at the left-hand margin and the stop screw backed away from the type bar carriage frame, loosen the two guide rail mounting screws. Lift the type bar carriage to disengage the carriage rack from the carriage rack driving gear and position it to meet the requirement. Tighten the two guide rail mounting screws. Screw the stop screw in until it touches the type bar carriage frame and tighten the locknut.

334. Carriage Roller Adjustment

(fig. 326)

a. Requirement. The type bar carriage should roll from one end of the guide rail to the other with no clearance between the carriage rollers and the guide rail.

b. Adjustment. Remove the carriage rack. Loosen the setscrew that holds the eccentric stud of the lower carriage roller and turn the eccentric stud until the requirement is met; tighten the setscrew. Adjust the carriage rack (par. 344).

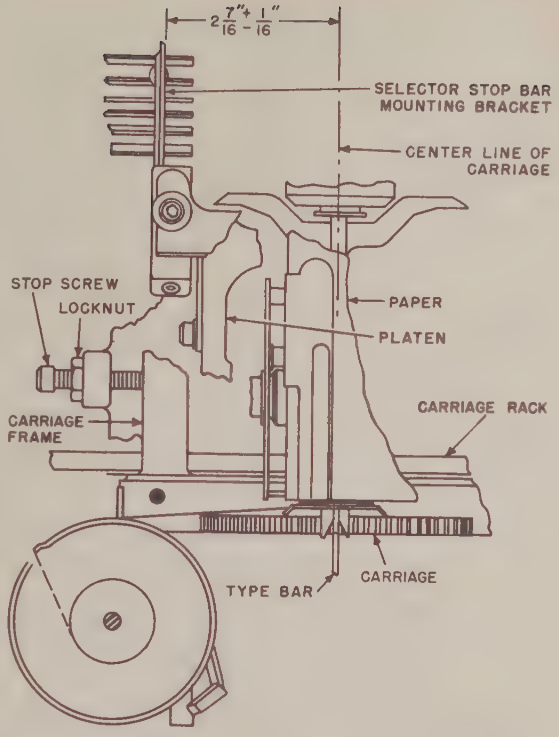


Figure 325. Type bar carriage positioning adjustment.

335. Carriage Rack Adjustment

(fig. 327)

a. Requirement. There should be minimum backlash between the large carriage driving gear and the carriage rack.

b. Adjustment. Move the type bar carriage to the left margin. Loosen the two carriage rack mounting screws and position the carriage rack for minimum backlash; tighten the mounting screw nearer the carriage driving gear. Move the typebar carriage to the right margin. Position the

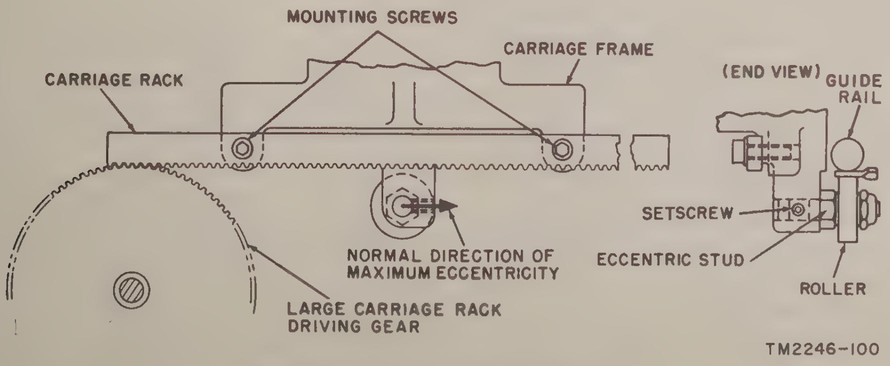


Figure 326. Carriage roller adjustment.

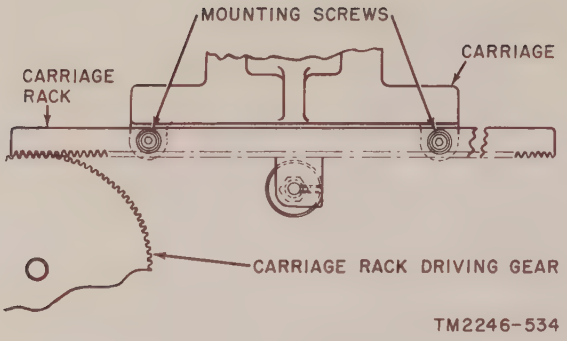


Figure 327. Carriage rack adjustment.

carriage rack for minimum backlash and tighten the second mounting screw. There should be equal but minimum backlash on both ends of the carriage rack (related adjustments pars. 333 and 334).

336. Carriage Return Latch Tripping Arm Adjustment

(fig. 328)

a. Requirement. The carriage return latch tripping arm should trip the carriage return clutch latch lever just as the type bar carriage strikes the left margin stop screw.

b. Adjustments.

(1) Move the carriage to the left, against the left margin stop. This should give a margin of 19/32-inch.

(2) Loosen the mounting screws that hold the carriage return latch tripping arm to the carriage driven gear.

(3) Disengage the carriage feed clutch. Rotate the carriage return gears until the protruding end of the decelerating cam is between 3/32 and 1/8 inch from the top edge of the decelerating arm. It may be necessary to disengage the carriage rack from the carriage driving gear to permit sufficient rotation to get the proper adjustment. This can be done by loosening the screws that hold the guide rail to the frame sufficiently to raise the type bar carriage so the carriage rack disengages the carriage driving gear. When the proper position is reached by the decelerating cam, the carriage rack and carriage driving gear should be reengaged and the screws should be tightened in the guide rail.

(4) Slide the carriage return latch tripping arm on the mounting screws against the carriage return clutch latch lever until the carriage return clutch actuating lever is just unlatched; tighten the carriage return latch tripping arm mounting screws.

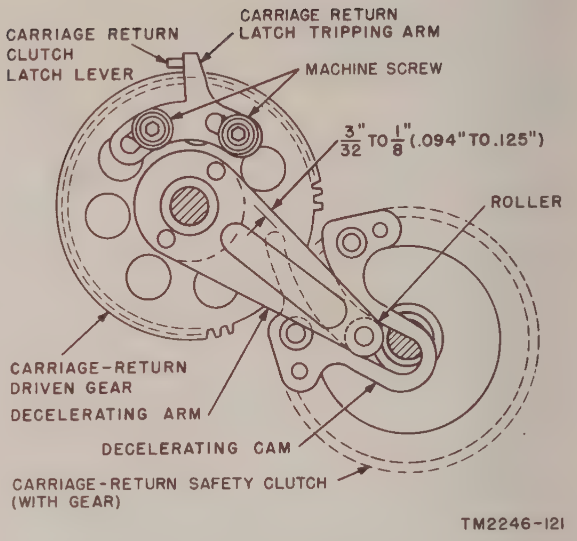

CARRIAGE RETURN CLUTCH LATCH LEVER
CARRIAGE RETURN LATCH TRIPPING ARM
MACHINE SCREW
3"/32 TO 1"/8 (.094" TO .125")
ROLLER
CARRIAGE-RETURN DRIVEN GEAR
DECELERATING ARM
DECELERATING CAM
CARRIAGE-RETURN SAFETY CLUTCH (WITH GEAR)
TM2246-121

Figure 328. Carriage return latch tripping arm adjustment.

(5) Check related adjustments in paragraphs 333 and 335.

337. Carriage Feed Sliding Clutch Drum Adjustment

(fig. 329)

a. Requirement. There should be .035- to .045-inch clearance between the carriage feed driving gear and the carriage feed sliding clutch drum when the carriage return clutch is fully engaged.

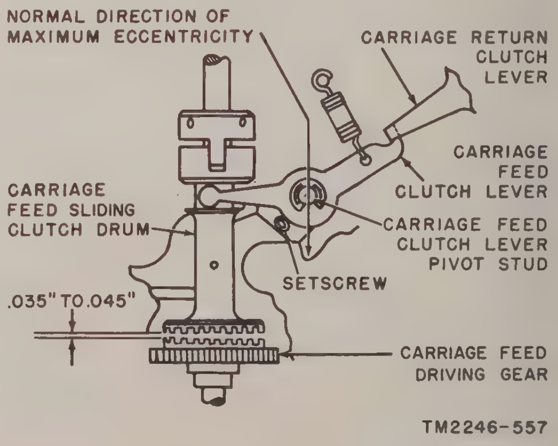

NORMAL DIRECTION OF MAXIMUM ECCENTRICITY
CARRIAGE RETURN CLUTCH LEVER
CARRIAGE FEED CLUTCH LEVER
CARRIAGE FEED SLIDING CLUTCH DRUM
CARRIAGE FEED CLUTCH LEVER PIVOT STUD
SETSCREW
.035" TO .045"
CARRIAGE FEED DRIVING GEAR
TM2246-557

Figure 329. Carriage feed sliding clutch drum adjustment.

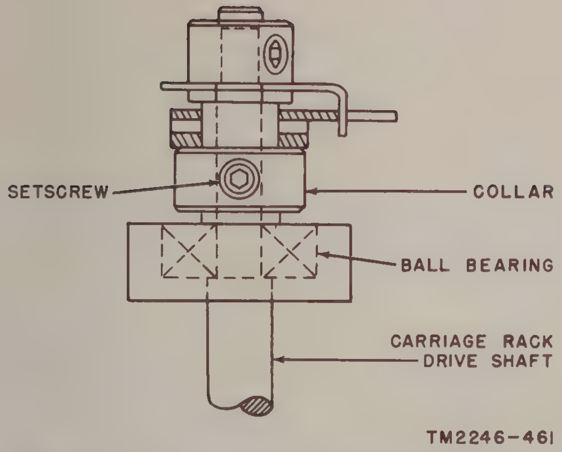


Figure 330. Carriage rack drive shaft position adjustment.

b. Method of Checking. With the carriage one or more spaces from the left-hand margin, turn the motor off. Select carriage return, release transfer lever, and turn the motor by hand until the carriage return clutch is fully engaged. Check the gap between the carriage feed sliding clutch drum and the carriage feed driving gear with a feeler gage.

c. Adjustment. Loosen the setscrew and turn the carriage feed clutch lever pivot stud with a screw driver until the requirement is met; tighten the setscrew.

338. Carriage Rack Drive Shaft Position Adjustment

(fig. 330)

a. Requirement. The shoulder on the carriage rack drive shaft should be tight against the ball bearing, and the collar should be tight against the ball bearing.

b. Method of Checking. Push and pull the carriage rack drive shaft lengthwise to determine whether there is play between the shaft and the bearing.

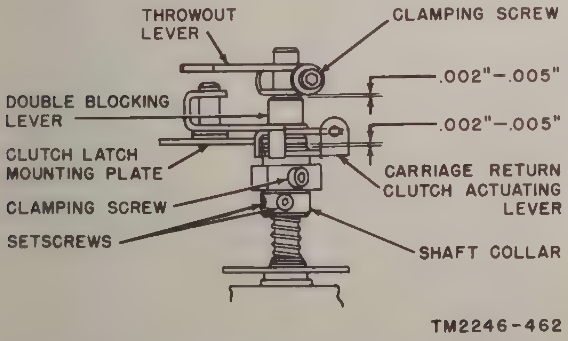


Figure 331. Carriage-return clutch lever shaft clearance adjustment.

c. Adjustment. Loosen the setscrew on the collar. Push the carriage rack drive shaft toward the collar until the shoulder of the shaft is against the ball bearing. Hold the shaft and push the collar against the ball bearing; tighten the setscrew.

Note. Adjustments paragraphs 339 through 346 should be made together.

339. Carriage Return Clutch Lever Shaft Clearance Adjustment

(fig. 331)

a. Requirements.

(1) There should be .002- to .005-inch clearance between the carriage return clutch actuating lever and the clutch latch mounting plate.

(2) There should be .002- to .005-inch clearance between the throwout lever and the double blocking lever.

b. Adjustments.

(1) Loosen the clamping screw on the carriage return clutch actuating lever and loosen setscrews on the shaft collar. With a feeler gage between the carriage return clutch actuating lever and the clutch latch mounting plate, slide the shaft collar up until the requirements are met; tighten the setscrews.

(2) Loosen the clamping screw on the throwout lever, place a feeler gage between the throwout lever and the double blocking lever, and tighten the clamping screw.

340. Carriage Return Clutch Adjustment

(fig. 332)

a. Requirement. The carriage return clutch should be pulled into full engagement when the carriage return sensing lever drops to the low point of its restoring cam.

b. Method of checking. With the type bar carriage one or more spaces from the left-hand margin, turn the motor off. Select carriage return, release the transfer lever, and turn the motor by hand until the carriage-return sensing lever drops to the lowest point on the restoring cam. The carriage return clutch should be fully engaged.

c. Adjustment. Detach the horizontal carriage return link from the carriage return bell crank. Turn the link in or out to meet the requirement. Attach the link to the carriage return bell crank, and recheck the requirement.

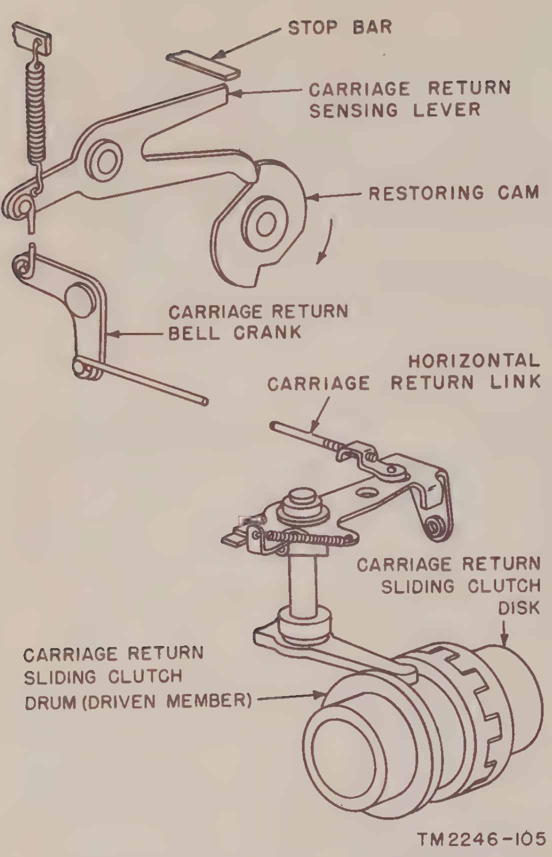

STOP BAR
CARRIAGE RETURN SENSING LEVER
RESTORING CAM
CARRIAGE RETURN BELL CRANK
HORIZONTAL CARRIAGE RETURN LINK
CARRIAGE RETURN SLIDING CLUTCH DISK
CARRIAGE RETURN SLIDING CLUTCH DRUM (DRIVEN MEMBER)
TM2246-105

Figure 332. Carriage return clutch adjustment.

341. Carriage Return Clutch Actuating Lever Adjustment

(fig. 333)

a. Requirement. There should be .002- to .005-inch clearance between the carriage-return clutch actuating lever and the carriage-return clutch latch lever when the type bar carriage is two or more spaces out from the left-hand margin and the carriage return clutch latch lever is in the latched up position.

b. Method of Checking. With the type bar carriage two or more spaces out from the left-hand margin and the motor off, select carriage return. Release the transfer lever and turn the motor by hand until the carriage return clutch is fully engaged. Check the clearance with a feeler gage.

c. Adjustment. Loosen the clamping screw and rotate the carriage return clutch actuating lever to meet the requirement. Check with a feeler gage, and tighten the clamping screw.

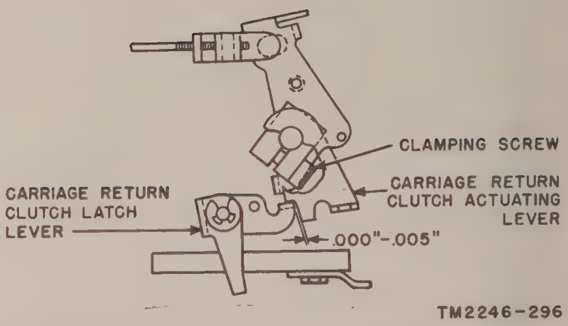

CLAMPING SCREW
CARRIAGE RETURN CLUTCH LATCH LEVER
CARRIAGE RETURN CLUTCH ACTUATING LEVER
.000"-.005"
TM2246-296

Figure 333. Carriage return clutch actuating lever adjustment.

342. Carriage Return Clutch Latch Lever Adjustment

(fig. 334)

a. Requirement. There should be .002- to .005-inch clearance between the carriage return clutch actuating lever and the carriage return clutch latch lever when the type bar carriage is all the way to the left-hand margin.

b. Method of Checking. With the type bar carriage all the way to the left-hand margin and the motor off, check the gap between the carriage return clutch actuating lever and the carriage return clutch latch lever with a feeler gage.

c. Adjustment. Loosen the two adjusting screws and slide the carriage return latch tripping arm clockwise or counterclockwise on the carriage

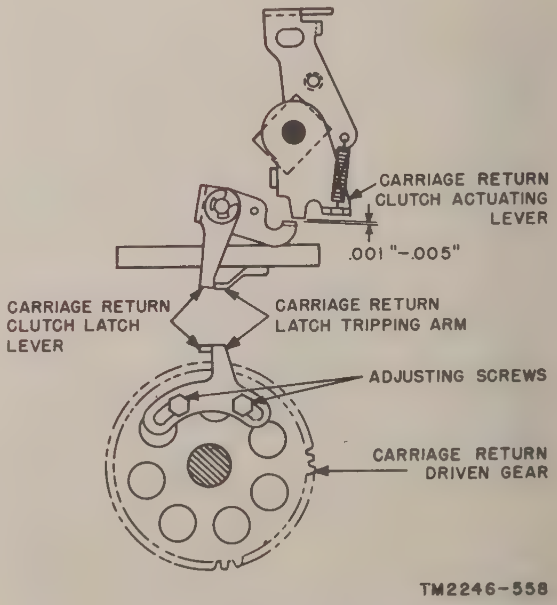

CARRIAGE RETURN CLUTCH ACTUATING LEVER
.001"-.005"
CARRIAGE RETURN CLUTCH LATCH LEVER
CARRIAGE RETURN LATCH TRIPPING ARM
ADJUSTING SCREWS
CARRIAGE RETURN DRIVEN GEAR
TM2246-558

Figure 334. Carriage return clutch latch lever adjustment.

return driven gear to meet the requirement. Tighten the adjusting screw and recheck the gap.

343. Throwout Lever Adjustment

(fig. 335)

a. Requirement. The carriage return latch tripping arm should engage the throwout lever when the carriage return clutch is ½ to ¾ disengaged.

b. Adjustment. Loosen the clamping screw of the throwout lever. Space the carriage out from the left margin three or more spaces and select carriage-return. Turn the motor slowly by hand until carriage-return clutch is ½ to ¾ disengaged. Rotate the clutch throwout lever until it just touches carriage return latch tripping arm. Tighten the clamping screw holding the throwout lever. (Check related adjustment pars. 339–427.)

344. Carriage Return Blocking Lever Clearance Adjustment

(fig. 336)

a. Requirement. There should be .002- to .005-inch clearance between the carriage return blocking lever and the spacer when the carriage return blocking lever adjusting collar is tight against the spacer.

b. Method of Checking. Check the clearance between the carriage return blocking lever and the spacer with a feeler gage.

c. Adjustment. Peel the laminated spacer to get the required clearance between the spacer and the carriage return blocking lever. The carriage return blocking lever adjusting collar should be tight against the spacer.

345. Carriage Return Blocking Lever Adjusting Collar Adjustment

(fig. 337)

a. Requirement. There should be .005- to .015-inch clearance between the carriage return blocking lever and the adjusting plate when the type bar carriage is one space out from the left margin.

b. Method of Checking. With the type bar carriage one space from the left margin, select carriage return and turn the motor by hand until the carriage return sensing lever drops to the low point of the restoring cam. The double blocking lever will position the adjusting plate over the carriage return blocking lever. Measure the gap between the adjusting plate and the carriage return blocking lever.

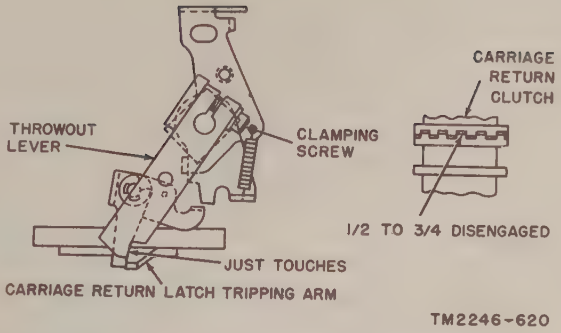


Figure 335. Throwout lever adjustment.

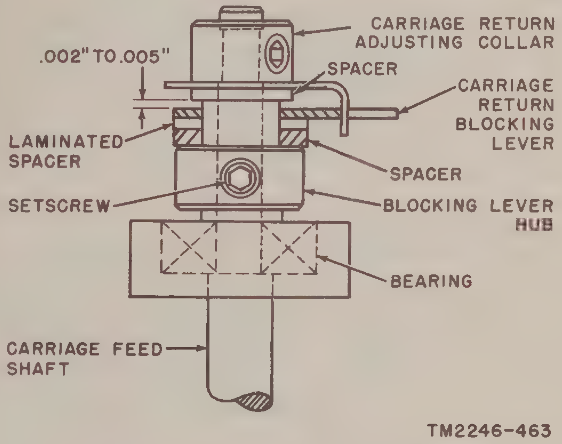


Figure 336. Carriage return blocking lever clearance adjustment.

c. Adjustment. Loosen the two set screws on the carriage return blocking lever adjusting collar and rotate the carriage return blocking lever until the requirement is met; tighten the two setscrews. Recheck carriage return blocking lever clearance adjustment. (par 344).

346. Carriage Return Adjustment Plate Adjustment

(fig. 338)

a. Requirement. There should be .025- to .035-inch clearance between the carriage return blocking lever and the adjustment plate when the type bar carriage is at the left margin. The carriage return sliding clutch drum and the carriage return sliding clutch disk must not touch each other when the carriage return is selected with the type bar carriage against the left stop.

b. Method of Checking. With the carriage all the way to the left margin and the motor off, check the gap between the carriage return block-

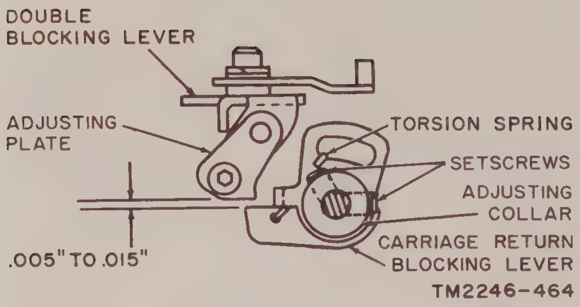


Figure 337. Carriage return blocking lever adjustment.

ing lever and the adjustment plate with a feeler gage.

c. Adjustment. Loosen the adjusting screw and move the adjustment plate to meet the requirement; tighten the adjusting screw. Select carriage return and release the transfer lever. Turn the motor by hand and check to see that the carriage return clutch does not engage.

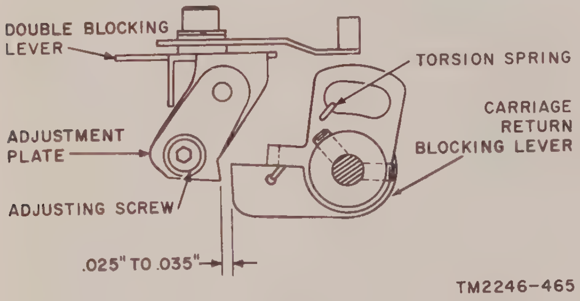


Figure 338. Carriage-return adjustment plate adjustment.

347. Manual Carriage Return Trip Pawl Adjustment

(fig. 339)

a. Requirement. The trip pawl should just clear the double blocking lever when the carriage return clutch is fully engaged.

b. Adjustment. Back off the nuts on the carriage return button link. Loosen the nut on the adjusting screw and push the manual carriage return button. When the double blocking lever is in the operated position for carriage return, turn the adjusting screw in or out until the trip pawl just clears the double blocking lever; tighten the nut on the adjusting screw.

348. Manual Carriage Return Lever Adjustment

(fig. 340)

a. Requirement. There should be .002- to .025-inch clearance between the manual carriage return lever and pin when the manual carriage return button has been pushed until stopped by the nuts against the carriage return button bracket.

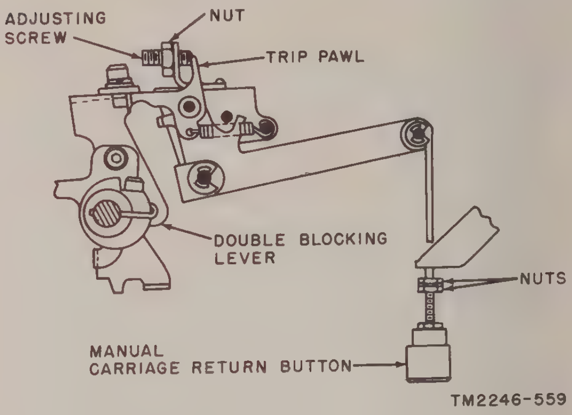


Figure 339. Manual carriage return trip pawl adjustment.

b. Adjustment. Loosen the two nuts on the carriage return button link. Push the manual carriage return button until the double blocking lever is in the operated position for carriage return. Turn the nuts until clearance between the manual carriage return lever and the pin is met and the nuts are against the carriage return button bracket. Tighten the two nuts against each other; recheck the clearance.

c. Manual Carriage Return Bracket Adjustment.

(1) *Requirement.* There should be .005- to .015-inch clearance between the trip pawl and the double blocking lever when the trip pawl is against the adjusting screw and the double blocking lever is away

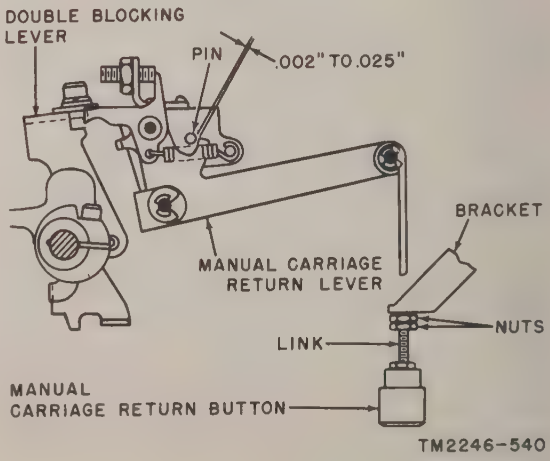


Figure 340. Manual carriage-return lever adjustment.

from the carriage return clutch actuating lever.

(2) *Adjustment.* Operate the manual carriage return button, unlatch the carriage return clutch actuating lever and position the bracket to meet the requirement in (1) above. Tighten the two bracket mounting screws.

349. Carriage Feed Pawl Adjustment

(fig. 341)

a. Requirement. There should be .005- to .025-inch gap between the ratchet wheel and carriage feed pawl when the carriage feed pawl is pulled to maximum disengagement by the carriage feed link.

b. Method of Checking. Select any one of the printed characters and, with the motor off, release the transfer lever. Turn the motor by hand until the carriage feed pawl has reached maximum disengagement. Check the clearance with a feeler gage.

c. Adjustment. Remove the connecting link from the carriage feed pawl and turn in or out to meet the requirement. Replace the connecting link on the carriage feed pawl.

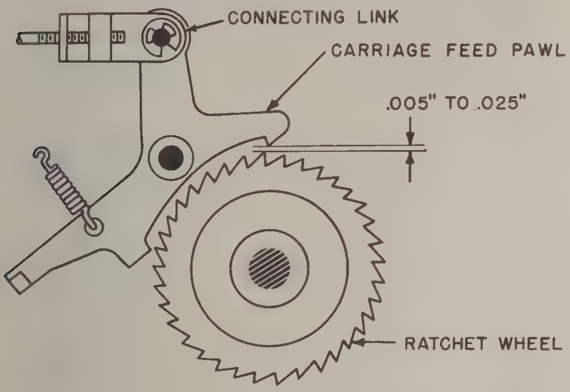


Figure 341. Carriage feed pawl adjustment.

350. Manual Space Push Button Adjustment

(fig. 342)

a. Requirement. There should be .015- to .035-inch clearance between the carriage feed pawl and the ratchet wheel when the manual space button is depressed all the way.

b. Method of Checking. With the motor off, depress the manual space button and check the clearance between the carriage feed pawl and the ratchet wheel with a feeler gage.

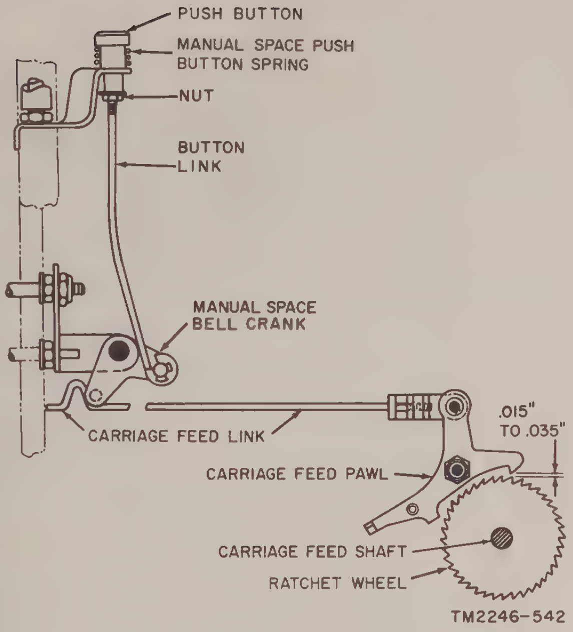


Figure 342. Manual space push button adjustment.

c. Adjustment. Loosen the nut on the button link, turn the button clockwise or counterclockwise to obtain the required clearance. Tighten the nut on the button link.

351. Function Cam Adjustment

(fig. 343)

a. Requirement. There should be .008- to .020-inch clearance between the function selecting arm and the punch bar guide block when the function selecting arm is in its unoperated position.

b. Adjustment. Loosen the function cam setscrews. Move the function cam in or out on the function shaft until the requirement is met; tighten the setscrews.

c. Angular Relationship of Function Shaft Parts.

(1) *Requirement.*

(*a*) There should be a complete transfer and the print cam follower in the low part of the cam.

(*b*) The function cam follower should be just past the high part of the function cam.

(*c*) The line feed and platen shift sensing cam should be positioned to require a 1/3 to 2/3 rotation of the motor before any sensing lever is allowed to fall to the low portion of its restoring cam.

(2) *Method of checking.*

(*a*) Where the sliding clutch drum is

against the clutch latch, move the transfer lever latch away from the transfer lever. There should be no movement of the print bail blade.

(*b*) When the transfer lever latch is moved away from the transfer lever there should be no axial movement of the function selecting arm.

(*c*) When the transfer lever latch is moved away from the transfer lever it should require 1/3 to 2/3 rotation of the motor to allow any one of the sensing levers to fall toward the low part of its restoring cam.

(3) *Adjustment.*

(*a*) Loosen the set screws in the print cam and flex the coupling and position the print cam and coupling to meet the requirement in (*a*)(1) above. Check paragraphs 328 and 374. Readjust, if necessary.

(*b*) After a full transfer has been established, in (1) above, loosen the two setscrews in the function cam and position to meet the requirement in *a*(2) above. Check and readjust if necessary. Check related adjustment (*c*(2)) above.

(*c*) After the requirements of *a*(1) and (2) above have been established, loosen the two setscrews in the line feed and platen shift sensing cam and position the cam assembly to meet the requirement in (*a*(3)) above. Check related adjustments in paragraphs 305 and 306.

352. Type and Function Selecting Arms Adjustments

(fig. 343)

a. Requirements. The positions of the type selecting arm and the function selecting arm must correspond to the position of the square shaft stop arm. There should be .015- to .046-inch clearance between the frame and the driving claw of the function selecting arm.

b. Adjustments.

(1) *Type selecting arm.* Select the blank combination; move all five code bars counterclockwise. Loosen the stop arm clamping screw and turn the square shaft until the type selecting arm is opposite the blank connecting bar slot. Be sure that the backlash in the gearing of the type selecting arm is distributed equally on both sides of the connecting bar slot; hold the square shaft in this position and turn the square shaft stop arm until it contacts the blank stop bar; tighten the clamping screw.

(2) *Function selecting arm.* Loosen the clamping screw in the function selecting arm claw of the function selecting arm. Select the letter H (third and fifth code bars clockwise, others counterclockwise), and turn the square shaft until its stop arm contacts the H stop bar. Turn the function selecting arm so that it is opposite the motor stop function punch bar. Position the function selecting arm claw to have about .015- to .046-inch clearance, as shown, and tighten the clamping screw.

353. Platen Trough Spring Adjustment

(fig. 344)

a. Requirement. It should require 3 to 6 ounces to start the bottom platen trough moving.

b. Adjustment. Remove the pin and wind or unwind the torsion springs to meet the requirement; reinstall the pin.

354. Paper Guide Alinement and Adjustment

(fig. 345)

a. Requirement. The sprocket feed pins should be spaced equally in slots of the paper guide. Both paper guides should be in contact with the platen.

b. Adjustment. Loosen setscrews on right-hand and left-hand paper guides. Slide the right-hand paper guide on the shaft until the sprocket feed pins are spaced equally in the paper guide slot; tighten the setscrews. Slide the left-hand paper guide to line up sprocket feed pins in the slot. With the guide against the platen, tighten the setscrews.

355. Sprocket Feed Pins Operational Adjustment

(fig. 346)

a. Requirement. To retract or extend the pinwheel pins.

b. Adjustment. Hold the pinwheel drive by inserting a screwdriver or similar instrument into the slot on one side. Turn the platen crank until the sprocket feed pins are in the desired position. Repeat this procedure for the other set of sprocket feed pins.

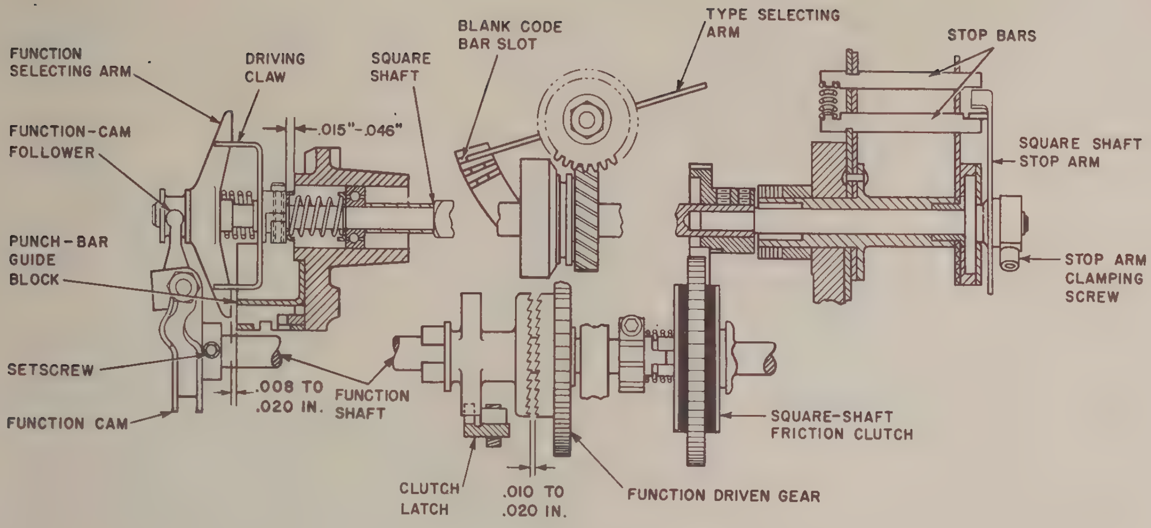


Figure 343. Function cam adjustment.

356. Pressure Roller Lever Position Adjustment
(fig. 347)

a. Requirement. The pressure roller lever should be in the sprocket feed notch (forward notch) when sprocket hole paper is being used, and in the friction feed notch (rear notch) when plain paper is being used.

b. Adjustment. Push on the platen lever latch to release the pressure roller lever. Position the pressure roller lever to satisfy the requirement and release the platen lever latch. (Related adjustments, pars. 353–355 and 357–360.)

357. Platen Pressure Roller Adjustment
(fig. 348)

a. Requirement. There should be sufficient pressure against the platen by the platen pressure roller to pull the paper one or two line spaces when the line feed operation takes place.

b. Adjustment. Place the platen pressure roller

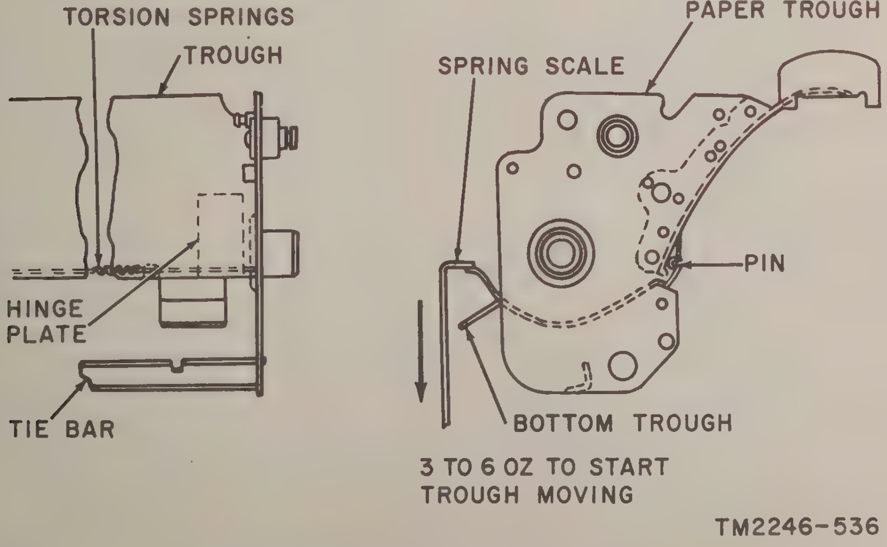


Figure 344. Platen trough spring adjustment.

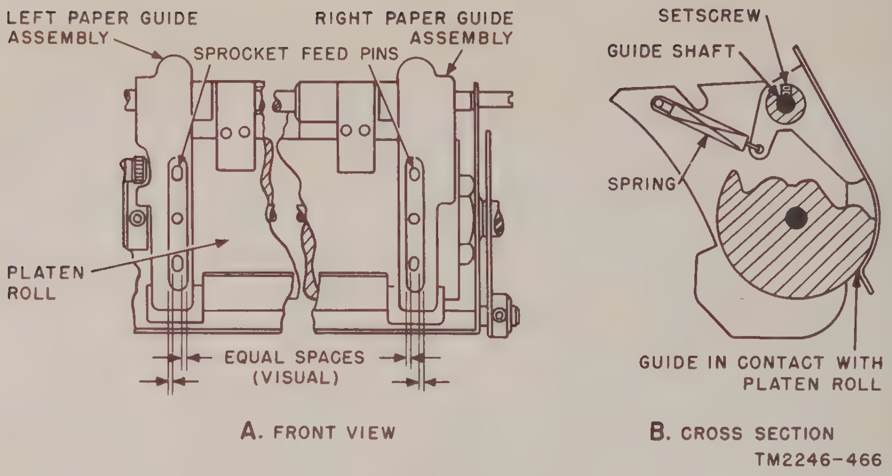


Figure 345. Paper guide alinement and adjustment.

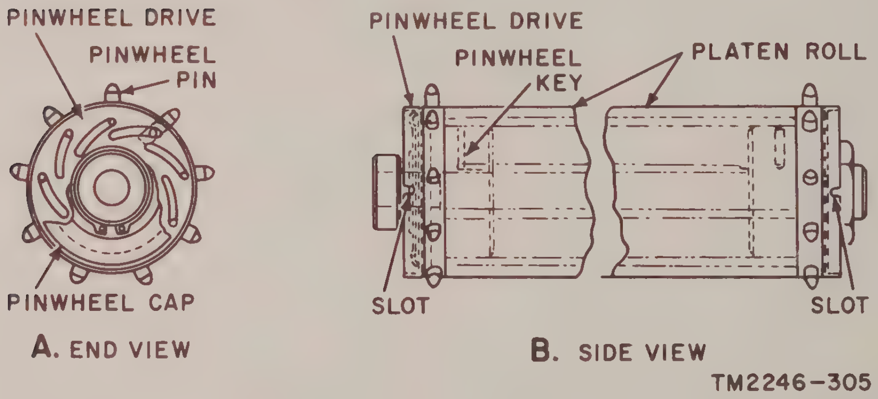


Figure 346. Sprocket feed pins operational adjustment.

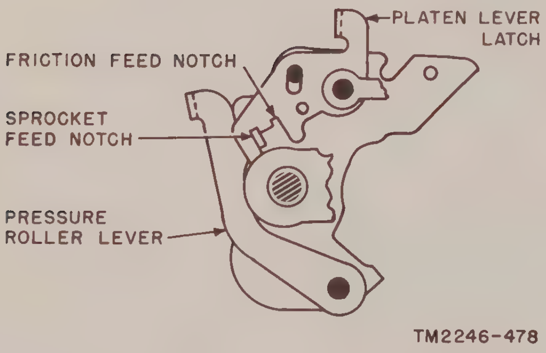


Figure 347. Pressure roller lever position adjustment.

lever in the locked position and loosen the mounting set screws. Rotate the platen pressure roller mounting shaft, using a ¼-inch open-end wrench inserted from the rear of the machine to move the platen pressure roller against the platen. Tighten the set screws.

358. Character Alinement Adjustment
(fig. 349)

a. Requirement. The first few characters and the last few characters on a line should appear of equal density. There should be no variation from one end of the line to the other.

b. Adjustment. Print a full line of characters.

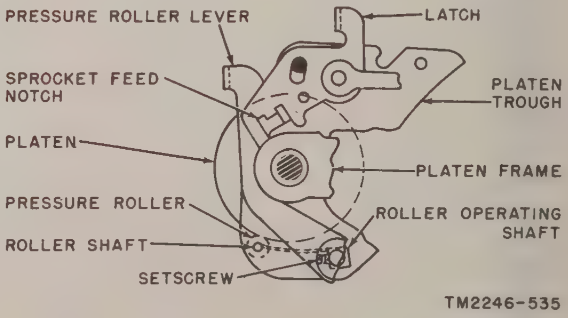


Figure 348. Platen pressure roller adjustment.

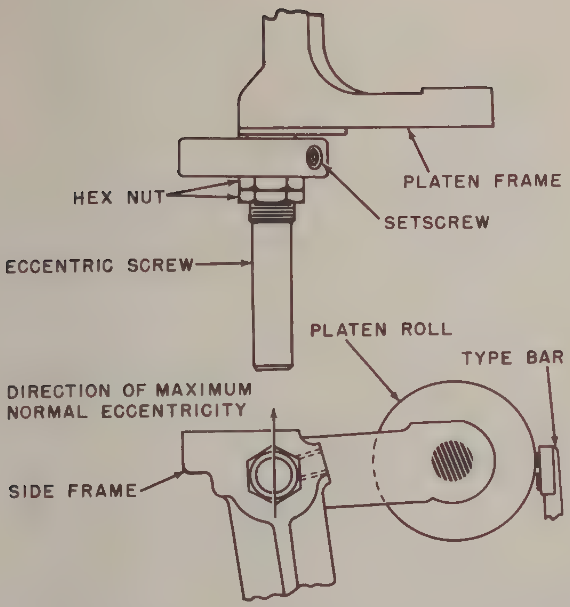


Figure 349. Character alinement adjustment.

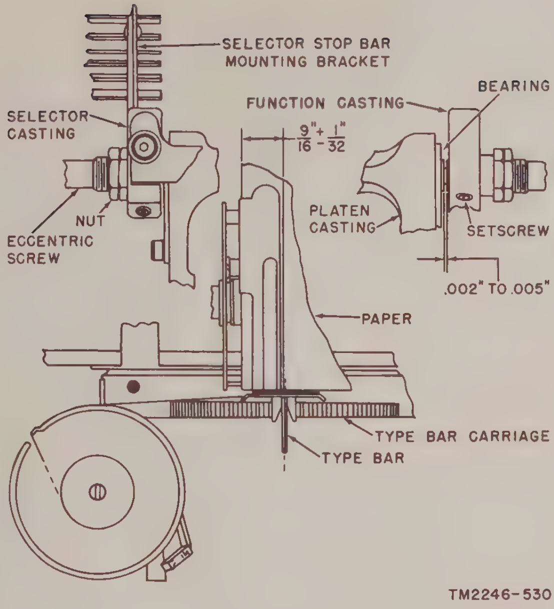


Figure 350. Platen assembly end play and positioning adjustment.

Loosen the eccentric pivot set screws on the selector and function side frames. If the line varies near the right-hand margin, turn the right-hand eccentric screw. If the line varies on the left-hand margin, turn the left-hand eccentric pivot. If necessary, use both eccentric pivots until the requirement is met. The direction of eccentricity on both eccentric pivots should be approximately the same. Hold the eccentric pivots in against the castings and tighten the set screws. (Check related adjustments pars. 353, 354, 355, 357, 359, and 360.)

359. Platen Assembly End Play and Positioning Adjustment

(fig. 350)

a. Requirement. There should be 9/16-inch between the left hand edge of the paper and the left hand edge of the first character when the carriage is in the left hand margin, and .002- to .005-inch clearance between the eccentric screw and the bearing in the platen casting.

b. Adjustment. With the carriage in the left hand margin, loosen the four hexagonal nuts and two setscrews. Hold the platen against the right hand eccentric screw and move the screw until the 9/16-inch requirement is met; tighten the two hexagonal nuts and the setscrew on this side. (Check related adjustments, pars. 353, 354, 355, 357, 358, and 360.)

360. Platen Shift Preliminary Adjustment

(fig. 351)

a. Requirement. The platen latch should engage the lug on the aperture gate when the platen is moved to figures position.

b. Adjustment. Loosen the mounting screw that holds the shift arm. Position the shift arm to meet the requirement and tighten the mounting screw. (Check related adjustments, pars. 353, 354, 355, 357, 358, and 359.)

361. Figures Shift Position Adjustment

(fig. 352)

a. Requirement. Characters should be printed evenly without being cut off at the top or the bottom when the platen is in the figures position.

b. Method of Checking. With the platen in the figures position, send repeated R and Y signals, and inspect the typed result for cutoff at the top or the bottom of the character.

c. Adjustment. Loosen the platen latching arm mounting screw, position the platen latching arm up or down so that cutoffs of characters are eliminated, and tighten the mounting screw. If all adjustments in sequence are not being made, check the letters shift position adjustment (par. 362) and the platen shift final adjustment (par. 363).

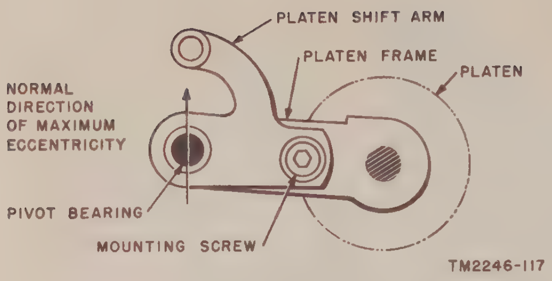


Figure 351. Platen shift preliminary adjustment.

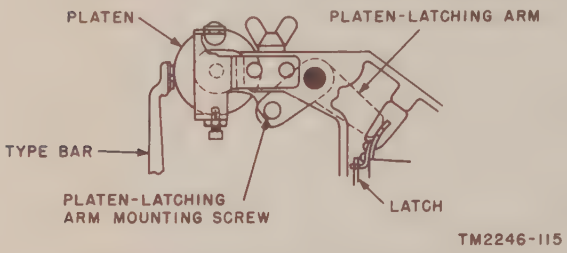


Figure 352. Figures shift position adjustment.

362. Letters Shift Position Adjustment
(fig. 353)

a. Requirement. Characters printed with the platen in the letters-shift position should be perfectly alined with characters printed with the platen in the figures shift position.

b. Method of Checking. With the platen first in the figures position and then in the letters position, send repeated R and Y signals and inspect the typed result for alinement.

c. Adjustment. Loosen the locknut that holds the platen stop screw of the platen bracket. If the letters print below the figures, turn the stop screw counterclockwise. If the letters print above the figures, turn the stop screw clockwise. It may be necessary to alter the figures shift position adjustment (par. 361) to be able to aline the characters. Recheck the requirement; readjust, if necessary, until the requirement is met. Tighten the locknut.

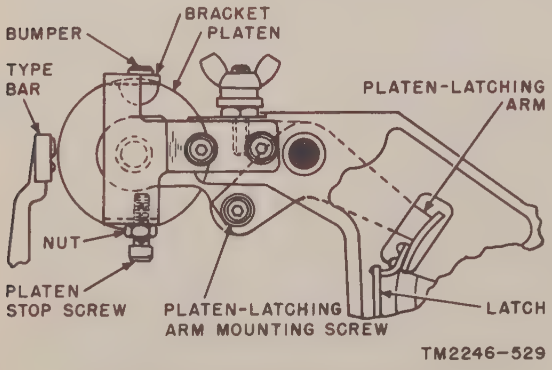


Figure 353. Letters shift position adjustment.

363. Platen Shift Final Adjustment
(fig. 354)

a. Requirement. There should be .005- to .020-inch clearance between the platen latch and the lug on the aperture gate when the roller of the figures shift cam follower is on the highest part of the figures shift cam.

b. Method of Checking. Select the figures combination group and turn the motor by hand until the roller of the figures shift cam follower is on the highest part of the figures shift cam. Check the requirement with feeler gages.

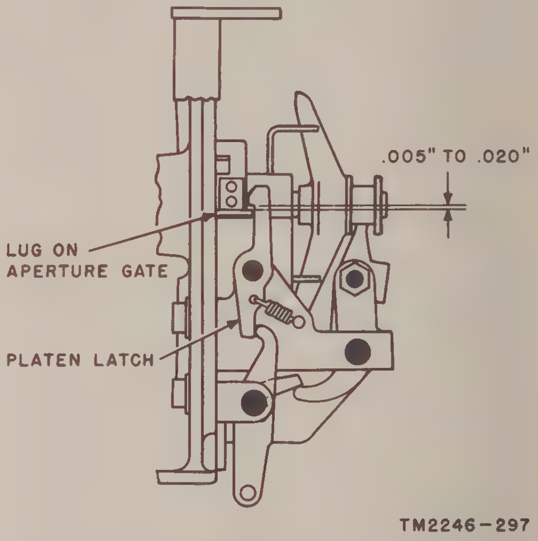


Figure 354. Platen shift final adjustment.

c. Adjustment. Loosen the mounting screw that holds the platen latching arm, reposition the arm to meet the requirement, and tighten the mounting screw. It may be necessary to readjust the figures shift position adjustment (par. 361) to be able to get the required clearance.

364. Platen Blocking Arm Adjustment
(fig. 355)

a. Requirement. There should be .005- to .015-inch clearance between the platen blocking arm and the platen lower case latch when the platen is in letters position.

b. Adjustment. With the platen in letters position, loosen the platen blocking arm mounting screw locknut. Position the platen blocking arm

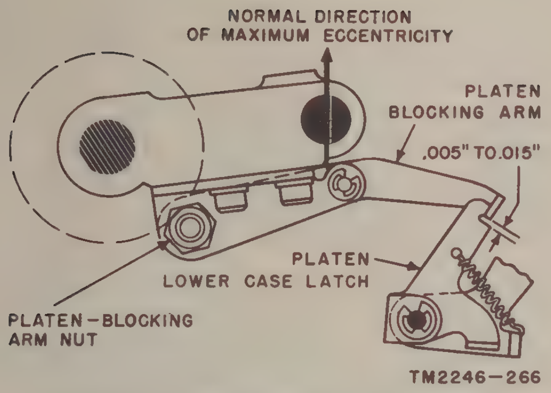


Figure 355. Platen blocking arm adjustment.

to obtain the requirement. Tighten the mounting screw locknut.

365. Line Feed Connecting Link Adjustment

(fig. 356)

a. Requirements.

(1) Selection of the line feed combination should cause the line feed mechanism to index the platen one line space with the single double line feed lever positioned for single line feed, and two line spaces with the single double line feed lever positioned for double line feeding.

(2) When the line feed operation is completed, the line feed pawl should be clear of the detent wheel, allowing the platen to be rotated in either direction.

b. Adjustment. Loosen the clamping screws that hold the line feed connecting link and position the single double line feed lever positioned for double line feed operation. Select the line feed combination and rotate the motor by hand until the line feed cam follower is on the high part of the cam. Rotate the line feed lever on which the line feed pawl is mounted until the platen has advanced two line spaces, and tighten the clamping screws to hold the line feed connecting link in this position. Continue to turn the machine until the line feed operation is completed and the parts are restored to their normal position. Be sure that the requirement in *a*(2) above is met. Check visually to see if the line feed detent is resting equally between two teeth on the detent wheel. If it is not, make the line feed bell crank adjustment (par. 366).

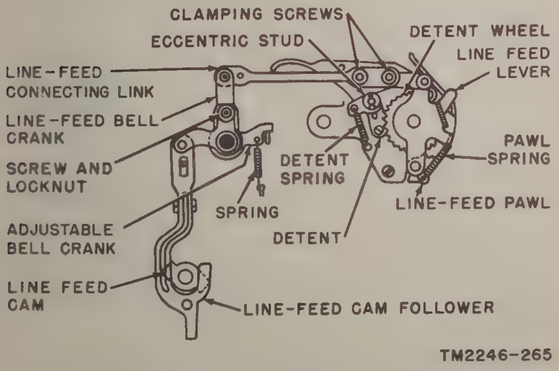


Figure 356. Line feed, line feed bell crank, and line feed detent adjustments.

366. Line Feed Bell Crank Adjustment

(fig. 356)

a. Requirement. With the single double line feed lever in the double line feed position, the platen should be rotated two full line spaces for each line feed operation.

b. Method of Checking. Select the line feed combination and turn the motor by hand until the line feed operation is completed. Check visually the number of line spaces the platen rotated and see if the line feed detent is resting equally between two teeth on the detent wheel.

c. Adjustment. Loosen the line feed adjustable bell crank locking nut. Turn the adjustable bell crank slightly clockwise and tighten the locking nut. Check the requirement; readjust if necessary until the requirement is met. It may be necessary to readjust the line feed adjustment (par. 365.)

367. Line Feed Detent Adjustment

(fig. 356)

a. Requirement. The tip of the line feed pawl should be on a radial line between two adjacent teeth of the detent wheel when the line space detent is resting equally between two teeth of the detent wheel.

b. Adjustment. Loosen the locking nut that holds the eccentric stud of the line space detent; turn the stud until the requirement is met and tighten the locking nut.

368. Manual Unshift Link Adjustment

(fig. 357)

a. Requirement. There should be .020- to .040-inch clearance between the operating end of the letters shift lever link and the letters shift lever when the manual letters shift mechanism is in the unoperated position.

b. Adjustment. Detach the connector link from

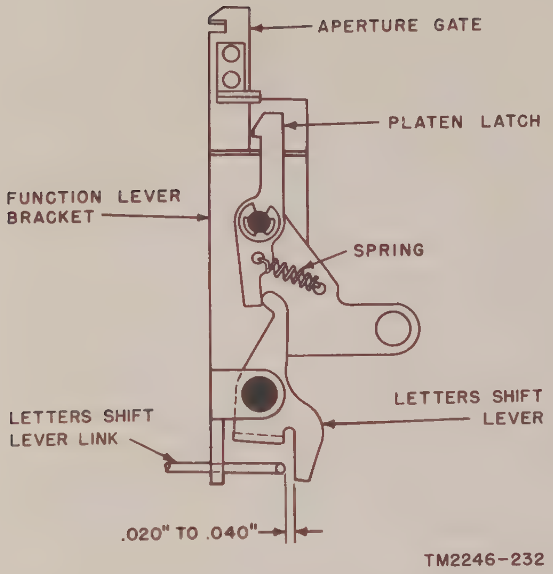


Figure 357. Manual unshift lever link adjustment.

the manual unshift bell crank and loosen its locking nut. Turn the connector link until the requirement is met and tighten the locking nut. Reattach the connector link to the manual unshift bell crank.

369. Carriage Feed Shaft Ratchet Wheel Adjustment

(fig. 358)

a. Requirement. There should be .010- to .020-inch clearance between the ratchet wheel and the flat on the space shaft.

b. Adjustment. Loosen the set screws on the ratchet wheel and slide the wheel to meet the requirement; tighten the set screws. Related adjustments par. 337, 338 and 350.

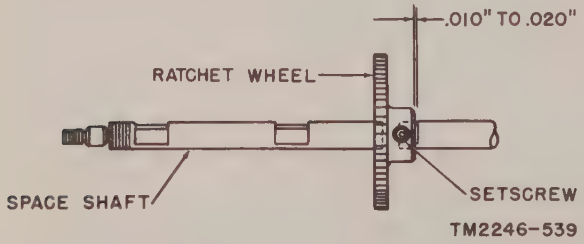


Figure 358. Carriage feed shaft ratchet wheel adjustment.

370. Carriage-feed Shaft Drive Shaft Collar Adjustment

(fig. 359)

a. Requirement. There should be 1$\frac{13}{16}$ inches, plus or minus $\frac{1}{64}$ inch, between the drive shaft collar and the shoulder on the carriage feed shaft.

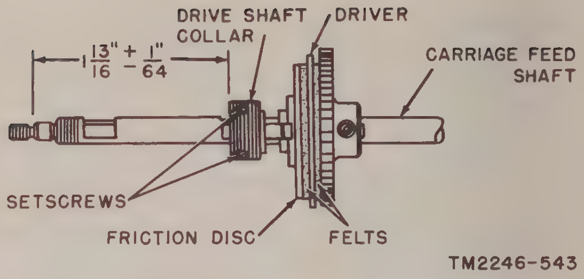


Figure 359. Carriage feed shaft drive shaft collar adjustment.

b. Adjustment. Loosen the set screws in the drive shaft collar and slide the drive shaft collar to meet the requirement; tighten the set screws. (Check related adjustments, paragraphs 337, 338, 350, 369, and 371.)

371. Carriage Feed Driven Gear Adjustment

(fig. 360)

a. Requirement. There should be 1⅛ inches, plus or minus $\frac{1}{64}$ inch, between the back face of the carriage feed driven gear and the machined surface on the base casting.

b. Adjustment. Loosen the set screws in the shaft collar and, with the carriage feed driven gear against the collar, slide the two parts to meet the requirement; tighten the set screws in the shaft collar. (Check related adjustment, paragraphs 337, 338, 350, 369 and 370.)

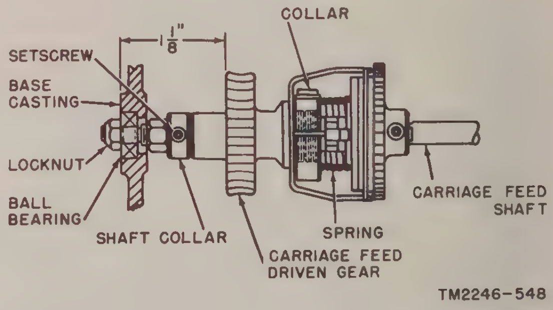


Figure 360. Carriage feed driven gear adjustment.

372. Carriage Feed Friction Clutch Adjustment

(fig. 361)

a. Requirement. It should require 40 to 48 ounces to hold the carriage from moving when the carriage feed mechanism operates.

b. Method of Checking. With the motor on, hook a spring scale on the left side of the carriage at a point over the carriage rack. Hold the spring scale firmly and depress the space bar and repeat key. When the carriage is arrested by the spring scale, check the reading against the requirement.

c. Adjustment. With the motor off, loosen the clamping screw in the adjusting collar and turn the adjusting collar to meet the requirement; tighten the clamping screw. It may be necessary to move carriage to position the clamping screw for tightening. Recheck the requirement and readjust if necessary.

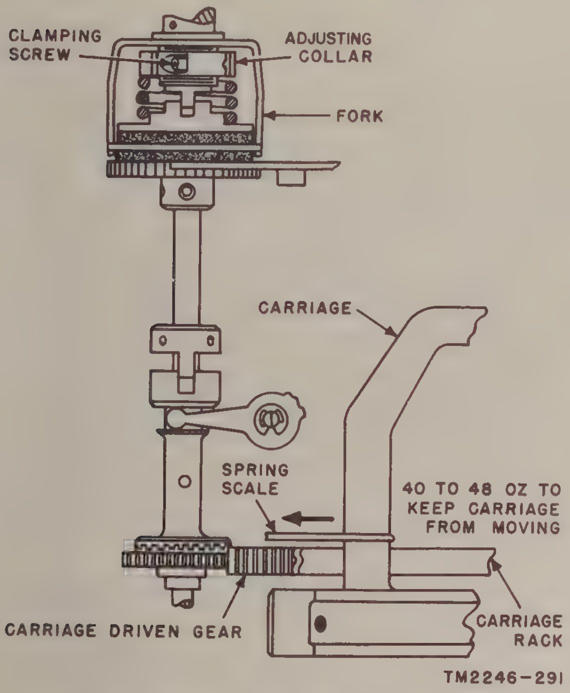


Figure 361. Carriage feed friction clutch adjustment.

373. Carriage Return Safety Clutch Adjustment

(fig. 362)

a. Requirement. Between 48 and 56 ounces of tension should be required to prevent the carriage from moving when the carriage-return mechanism is operating.

b. Method of Checking. With the motor on, move the carriage to the right margin. Hook a spring scale to the right side of the carriage and hold it securely while pressing the carriage-return key. The carriage should move immediately toward the left until the pull of the spring scale arrests it. Move the spring scale slowly to the left and read it when the carriage just starts to move again. This reading should equal the requirement.

c. Adjustment. Turn the motor on and position the carriage away from the left margin until a socket head wrench can be inserted into the clutch nut screw. Turn off the motor and insert the wrench into the clamping screw and loosen it. Turn the motor by hand until the carriage-return clutch is adjusted to meet the requirement. Turning the motor by hand clockwise increases the tension; turning it counterclockwise decreases the tension. Tighten the clamping screw, remove the wrench and recheck.

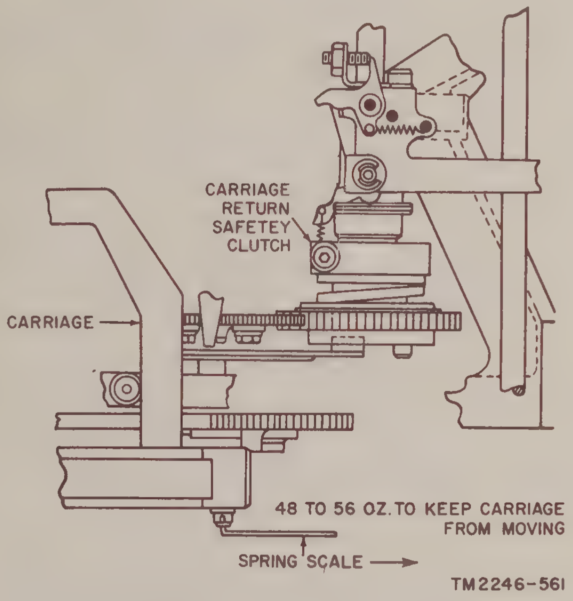

CARRIAGE RETURN SAFETEY CLUTCH
CARRIAGE
48 TO 56 OZ. TO KEEP CARRIAGE FROM MOVING
SPRING SCALE
TM2246-561

Figure 362. Carriage return safety clutch friction adjustment.

374. Printing Bail Adjustment

(fig. 363)

a. Requirements.

(1) The travel of the printing bail blade should be equal to each side of the vertical side of the vertical centerline through its shaft.

(2) There should be about 030-inch clearance between the type selecting arm and the guide plate when the function shaft clutch is engaged and the function shaft has been rotated clockwise by hand just far enough to move the print cam follower from the low part on the print cam. This clearance can be increased or decreased to get lighter or heavier printing. The minimum allowable clearance is .008-inch.

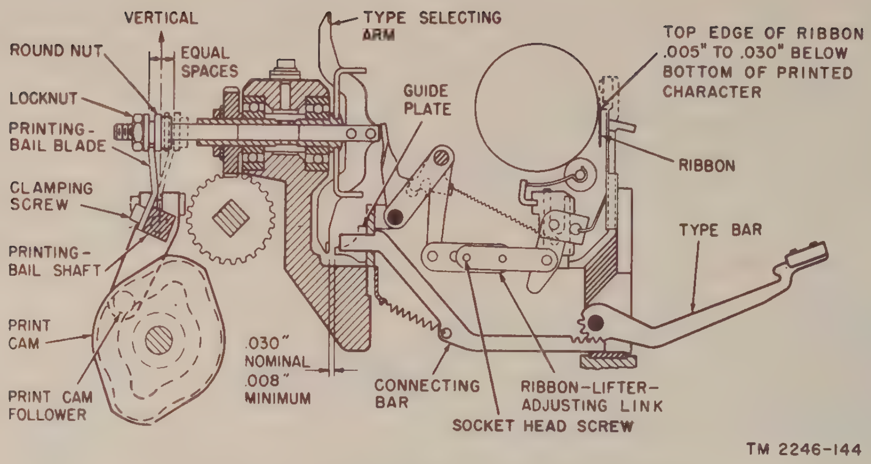


Figure 363. Printing bail and ribbon lifter adjustments.

b. Adjustments.

(1) Loosen the clamping screw on the print cam follower and turn the printing bail shaft so that the requirement is met; tighten the clamping screw. Check the requirement by observing that the clearance between the edge of the printing bail blade and the bottom of the round nut groove is the same in both the extreme forward and backward positions of the printing bail blade.

(2) Loosen the locknut on the end of the shaft of the type-selecting arm, turn the round nut until the requirement is met, and tighten the locknut against the round nut.

Note. This adjustment should always be made when changing from 60-wpm operation to 100-wpm operation, or vice versa.

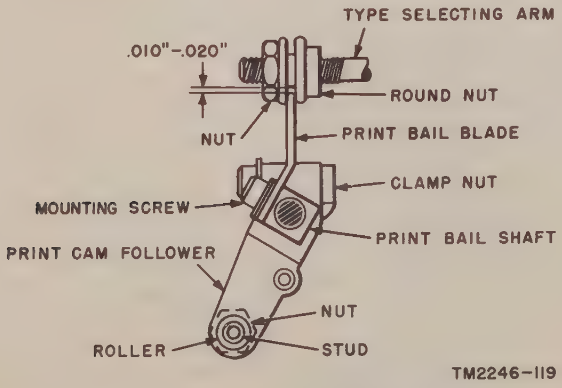


Figure 364. Printing bail blade adjustment.

375. Printing Bail Blade Adjustment

(fig. 364)

a. Requirement. There should be .010- to .020-inch clearance between the edge of the printing bail blade and the bottom of the round nut groove for the entire length of the printing bail blade.

b. Adjustment. Loosen the mounting screws that hold the printing bail blade and move the printing bail blade up or down until the requirement is met; tighten the mounting screws.

376. Ribbon Guide Adjustment

(fig. 363)

a. Requirement. The top edge of the ribbon should be .005- to .030-inch below the bottom edge of the printed character.

b. Adjustment. Loosen the socket head screws and move the link to meet the requirement; tighten the socket head screws.

377. Ribbon Reversing Detent Plate Adjustment

(fig. 365)

a. Requirement. There should be equal engagement on each side of the detent plate in both ribbon driving positions.

b. Method of Checking. With the detent spring removed, position the ribbon reversing beam so that the high points of the detent and plate meet. Clearances should be equal, or the engagement between the detent and detent plate should be equal in both positions of the beam.

c. Adjustment. Loosen the two mounting screws that hold the detent plate and, while holding the

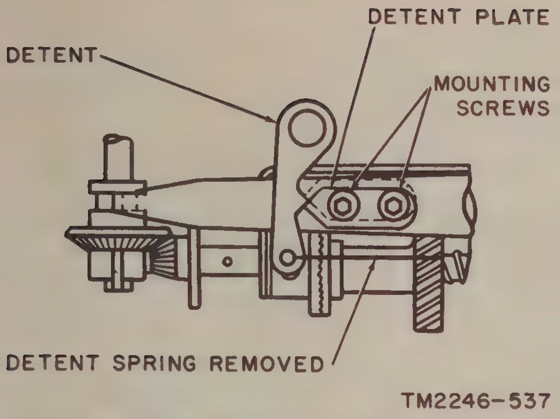


Figure 365. Ribbon reversing detent plate adjustment.

detent plate in position, shift the beam until the clearances are equal; tighten the mounting screws. Check both latched beam positions for equal engagement.

378. Left-Hand Margin Trip Plate Adjustment

(fig. 366)

a. Requirement. There should be .020- to .030-inch clearance between the stop bar shift stop and the delaying latch when the carriage is against the left margin stop screw.

b. Adjustment. Loosen the left- and right-hand margin trip plate mounting screws. Move the carriage against the left-hand margin stop screw. Move the left-hand margin trip either right or left, causing the angular rotation of the delaying lever to be increased or decreased until the requirement is met; tighten the mounting screws.

379. Ribbon Driving Shaft Adjustment

(fig. 367)

a. Requirement. There should be equal engagement of the bevel gears at each end of the ribbon driving shaft.

b. Adjustment. Loosen the set screws in the collars and in the clutch; shift the shaft so that the requirement is met and tighten the setscrews in the clutch. Place a .002- to .005-inch feeler gage between the clutch and mounting, hold the shaft to the left, hold the collar to the right to compress the spring, and tighten the setscrews in the collars.

380. Ribbon Driving Clutch Spring Adjustment

(fig. 367)

a. Requirement. The collar that holds the ribbon driving clutch spring should be ¼-inch from the face of the gear teeth on the clutch.

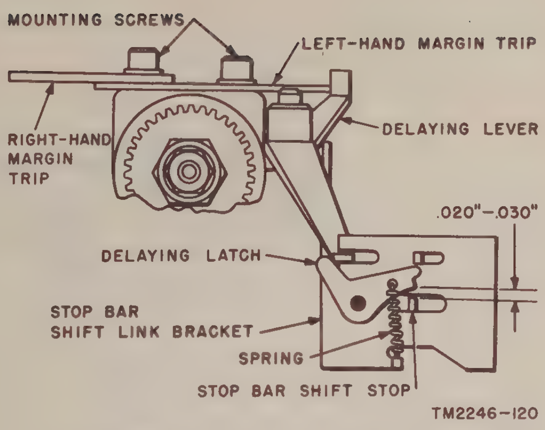


Figure 366. Left-hand margin trip adjustment.

b. Adjustment. Loosen the setscrews that hold the collar and shift the collar until the requirement is met; tighten the setscrews (check related adjustment paragraphs 377 and 379.)

381. Automatic Carriage Return Right-Hand Margin Trip Plate Adjustment

(fig. 368)

a. Requirement. The stop bar shift link should extend beyond the link support $\frac{7}{64}$ to $\frac{9}{64}$ inch when the carriage is in the 73d space position.

b. Adjustment. Loosen the mounting screw and slide the right hand margin trip plate to meet the requirement.

382. Automatic Carriage Return, Stop Bar Shift Stop Adjustment

(fig. 369)

a. Requirement. There should be .005- to .010-inch clearance between the stop bar shift stop and the delaying latch when the carriage is in the 73d space position.

b. Method of Checking. Space the carriage to the 73d position and check the gap with a feeler gage.

c. Adjustment. Loosen the socket setscrew and slide the stop bar shift stop to meet the requirement.

383. Automatic Carriage Return Stop Bar Shift Blade Adjustment

(fig. 370)

a. Requirement. There should be .015- to .020-inch clearance between the line feed sensing lever and the line feed function stop bar when the carriage is in any but the 72d or 73d space positions

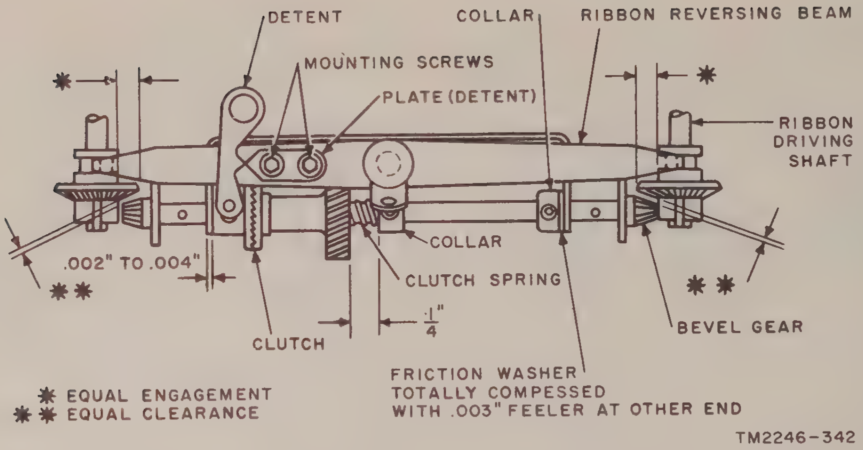


Figure 367. Ribbon driving shaft and clutch spring adjustments.

and the stop bar shift stop is latched by the delaying latch.

b. Method of Checking. Move the shift lever by hand until the stop bar shift stop is latched by the delaying latch; check the gap with a feeler gage.

c. Adjustment. Loosen the socket set screw and slide the stop bar shift blade to meet the requirement.

d. Final Check. When the carriage is returned to the left margin, there should be clearance between the bracket and the stop bar shift lever (par. 373). If the stop bar shift lever touches the bracket, loosen the socket set screws or the stop bar shift stop and the stop bar shift blade and turn the stop bar shift link to obtain a minimum of .005-inch clearance. Readjust, if necessary, for the requirements of paragraphs 381 and 382 and *a* above.

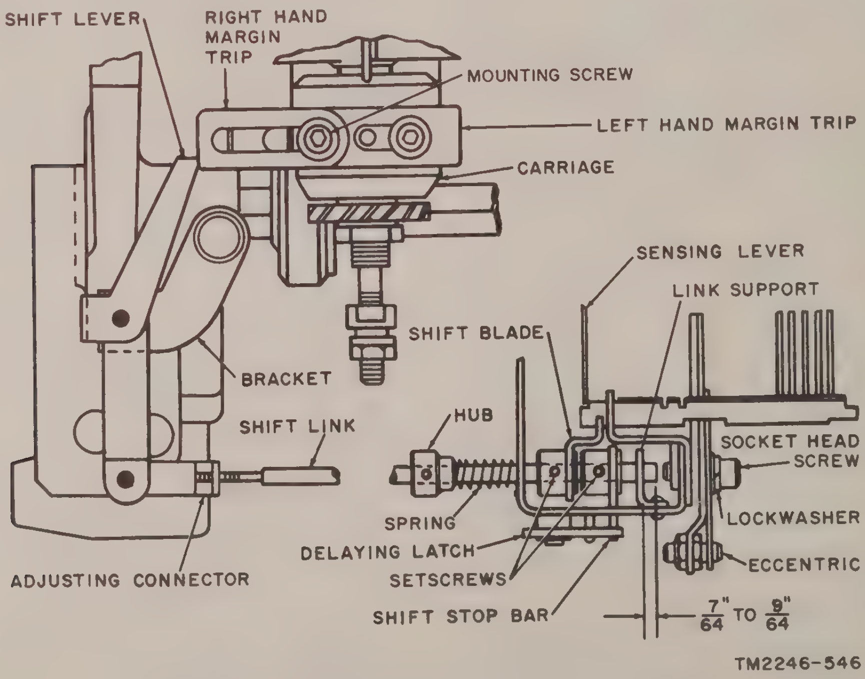


Figure 368. Automatic carriage-return, shift link adjustment.

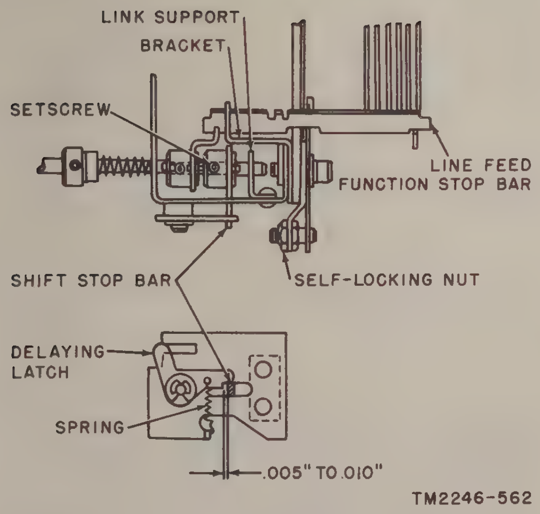


Figure 369. Automatic carriage-return, stop bar shift stop adjustment.

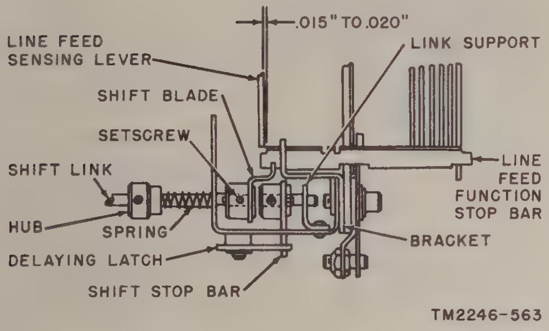


Figure 370. Automatic carriage return, stop bar shift blade adjustment.

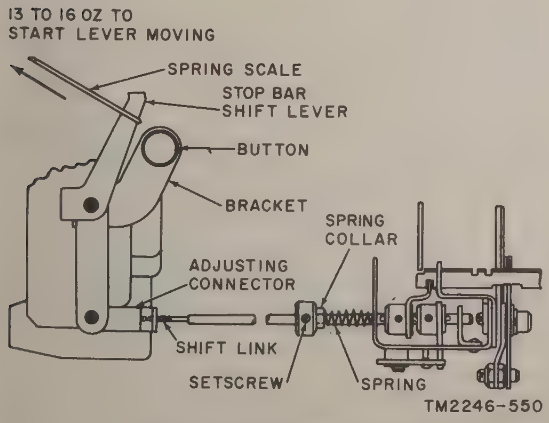


Figure 371. Automatic carriage-return stop bar return spring adjustment.

384. Automatic Carriage Return Stop Bar Return Spring Adjustment

(fig. 371)

a. Requirement. It should require 13 to 16 ounces to start the stop bar shift lever moving when the carriage is in the 73d position.

b. Adjustment. Loosen the setscrew and slide the spring collar to meet the requirement; tighten the setscrew. (Check related adjustments, paragraphs 378 and 381–383.)

385. Margin Signal Bell Adjustment

(fig. 372)

a. Requirement. The margin signal bell should ring on the 66th character from the left.

b. Method of Checking. Space the carriage out from the left margin. The margin bell should ring when the carriage reaches the 66th character position.

c. Adjustment. Loosen the adjusting screws and move the margin bell pawl trip arm to meet the requirement; tighten the adjusting screws. Recheck and readjust if necessary.

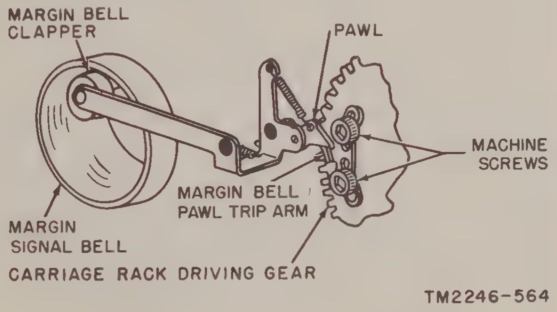


Figure 372. Margin bell adjustment.

386. Motor Stop Contacts Bracket Adjustment

(fig. 373)

a. Requirement. There should be .040- to .060-inch clearance between the motor stop actuating lever and the damper leaf spring when the motor-stop actuating lever is in the unoperated position.

b. Adjustment. Loosen the two mounting screws and position the bracket to obtain the requirement; tighten the two mounting screws.

(1) *Requirement.* With the platen in the shift position operation of the H-key should not cause the motor to stop.

(2) *Adjustment.* Loosen the two motor-stop mounting bracket screws. Position the

bracket away from the actuating lever until the actuating lever does not move the contacts when the platen is in the shift position and the H-lever selected. Tighten mounting screws.

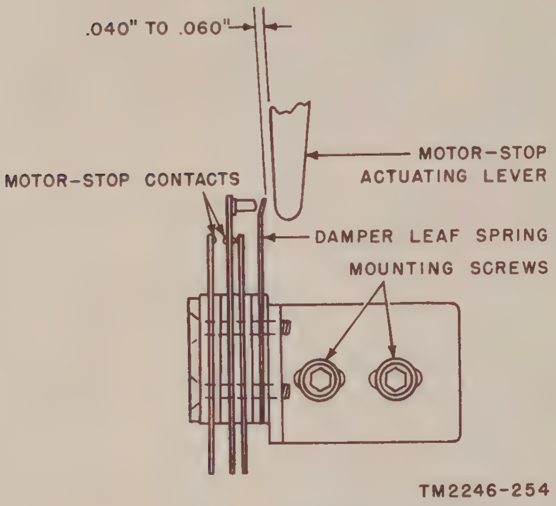


Figure 373. Motor stop contacts bracket adjustment.

387. Key Lever Locking Bar Adjustment

(fig. 374)

a. Requirement. There should be .005- to .030-inch clearance between the key lever locking bar and the key levers.

b. Adjustment. Loosen the three screws and move the key lever locking bar up or down to meet the requirement. Check both ends of the key lever locking bar and tighten the screws; recheck the clearance.

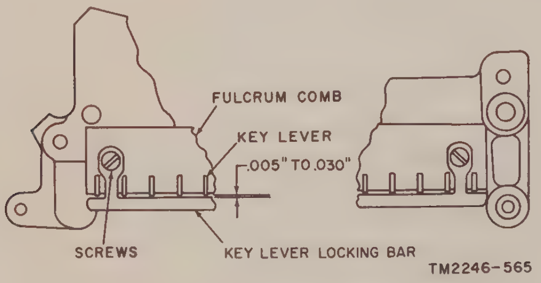


Figure 374. Key lever locking bar adjustment.

388. Selector Lever Pivot Post Adjustment

(fig. 375)

a. Requirements. There should be .002- to .005-inch clearance between the spacer and the sensing lever locking bail.

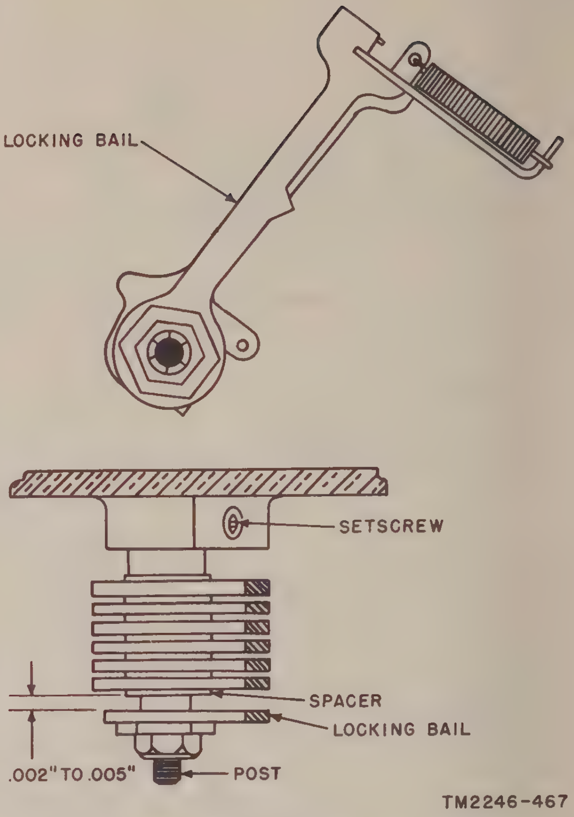


Figure 375. Selector lever pivot post adjustment.

b. Adjustment. Loosen the setscrew and move the selector lever pivot post in or out to meet the requirement; tighten the setscrew.

389. Sensing Levers Clearance and Alinement Adjustment

(fig. 376)

a. Requirement. The sensing levers and code bars should be in a line and there should be .001-

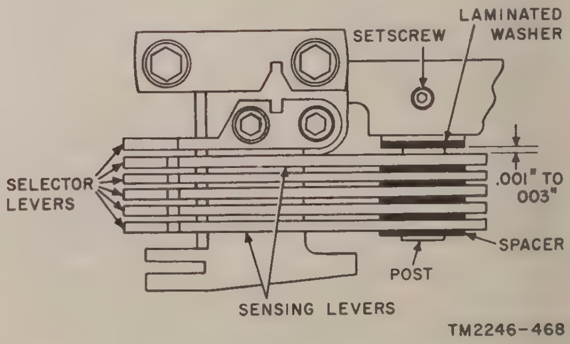


Figure 376. Sensing levers clearance alinement adjustment.

to .003-inch clearance between the spacer and sensing lever.

b. Adjustment. Peel the washer until sensing lever and code bar are in line. Move the post in or out to obtain the .001- to .003-inch clearance; tighten the setscrew.

390. Selector Levers and Sensing Levers Adjustment

(fig. 377)

a. Requirement. With the selector lever on the low part of the cam, there should be a minimum of .003-inch clearance between the selector levers and the sensing levers.

b. Adjustment. Adjust the comb to obtain minimum clearance. This adjustment should be made and checked at the same time as the minimum clearance when making the selector lever latch adjustment (par. 391).

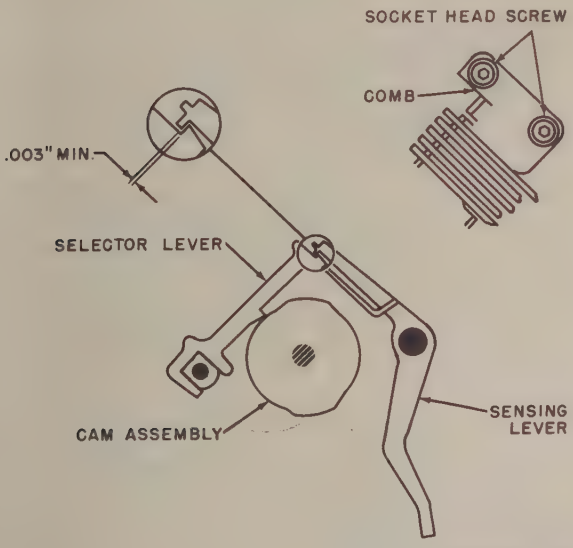


Figure 377. Selector levers and sensing levers adjustment.

391. Stop Selector Lever Latch and Transmitter Contact Adjustment

(fig. 378)

a. Requirement.

(1) The stop selector lever latch should be adjusted to give the correct stop pulse length. There should be .005-inch minimum clearance between the stop selector lever and stop selector lever latch when the stop selector lever is on the low point of its cam.

(2) There should be no breaks in line current between successive marking impulses sent by the sequential keyboard transmitter.

b. Method of Checking. Use Distortion Test Set TS–383/GG to measure the signal transmitted by the teleprinter.

c. Adjustment.

(1) Loosen the socket head screws. Turn the motor on and push the repeat key and blank key. With a screwdriver in the notch of the selector lever latch and latch bracket, move the selector lever latch to obtain the required stop signal length on a TS–383/GG. Move to the left to decrease and to the right to increase pulse length; tighten the screws and recheck the signal length.

(2) Connect a milliammeter across the sequential contact when the send plug P21 is disconnected.

(3) Remove the transmitter contact cover and back off the stationary mark contact.

(4) Depress the letters key and turn the motor by hand. Watch the milliammeter. It will show either breaks between marking impulses or no marking impulses at all if the contact is backed off far enough.

(5) Screw the mark contact down a short distance, depress the letters key and turn the motor by hand. Watch the milliammeter again.

(6) Repeat this procedure until all breaks between the marking impulses made by the five intelligence selector levers are eliminated.

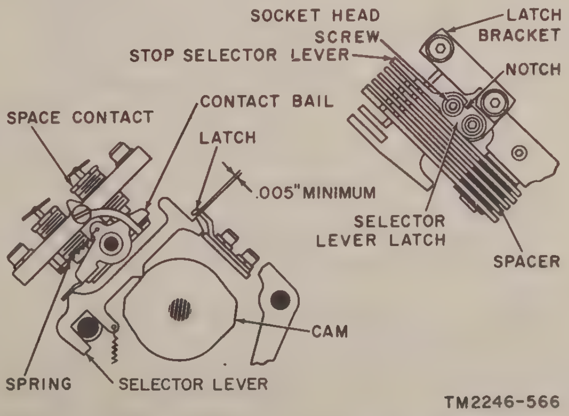


Figure 378. Stop selector lever latch adjustment.

392. Sensing Lever Locking Bail Adjustment

(fig. 379)

a. Requirement. There should be equal clearance between the sensing lever locking bail latching surface and the sensing levers latching surface for the mark and space positions.

b. Method of Checking. Depress either the R- or Y-key lever. Turn the XMTR camshaft clockwise by hand until the sensing lever locking bail engages the sensing levers; check the clearance visually.

c. Adjustment. Loosen the locknut. With the sensing lever locking bail engaged with the sensing levers, turn the eccentric bearing clockwise or counterclockwise until the requirement is met; tighten the locknut.

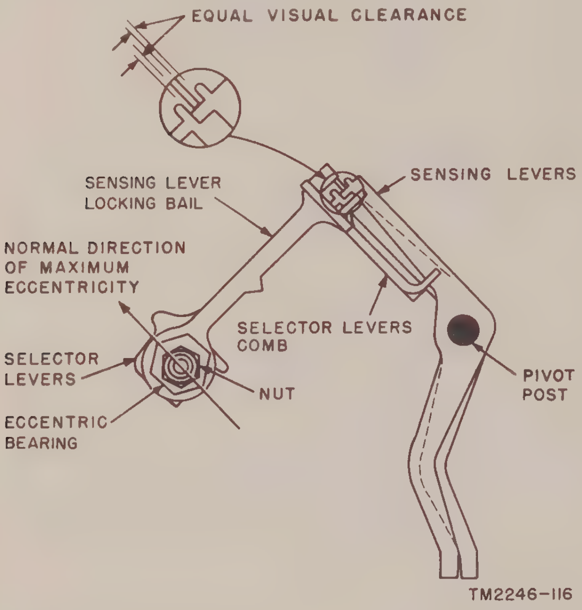


Figure 379. Sensing lever locking bail adjustment.

393. Switch Arm End Play Adjustment

(fig. 380)

a. Requirement. There should not be more than .005-inch clearance between the E-ring and the laminated spacer.

b. Adjustment. Peel the laminated spacer until the requirement is met.

394. Shunt Switch Arm Comb Adjustment

(fig. 381)

a. Requirement. The shunting switch arm should be in line with the switch arms. There should be an equal space between the shunting switch arm contacts and the slot in the shunt switch arm connector when the R or Y is selected.

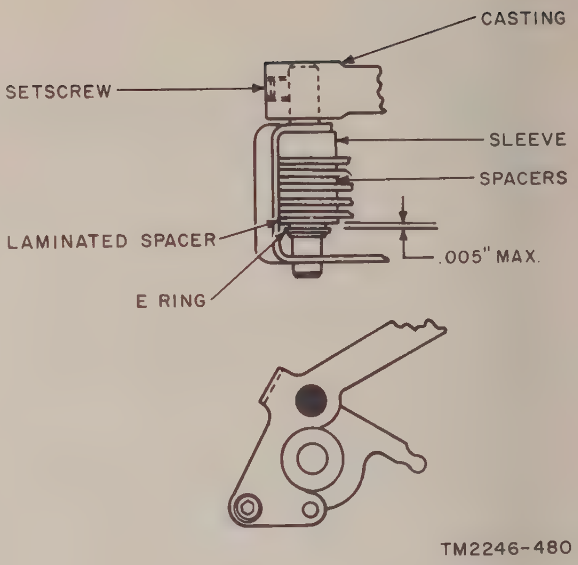


Figure 380. Switch arm end play adjustment.

b. Method of Checking. With the unit in the stop position and the motor off, push the R- or Y-key.

c. Adjustment. Loosen the two socket mounting studs. Move the shunt switch arm comb to line up the shunting switch arm contacts and the shunt switch arm connector. With the R or Y selected, move the shunt switch arm comb until equal clearance is obtained between the slot and

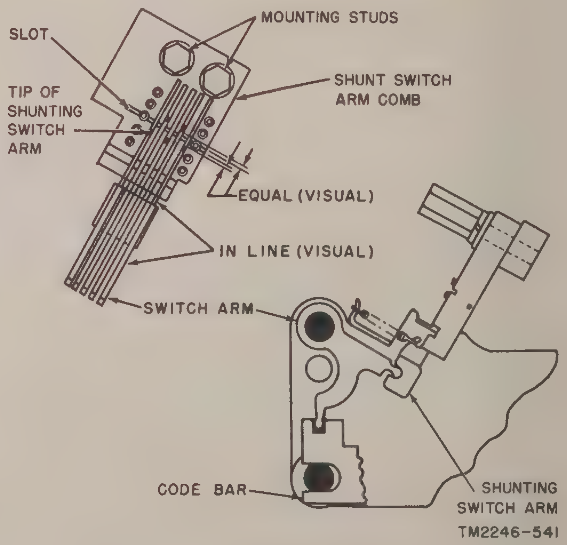


Figure 381. Shunt switch arm comb adjustment.

the shunting switch arm contacts; tighten the socket mounting studs.

395. Tab Actuator Arm Spring Adjustment

(fig. 382)

a. Requirement. A force of ¾ to 1¼ ounce should be required to start the tab actuator arm moving.

b. Adjustment. Loosen the self-locking hexagonal nut and turn the tab actuator arm stud with a screwdriver to meet the requirement. Tighten the self-locking hexagonal nut and recheck the spring requirement.

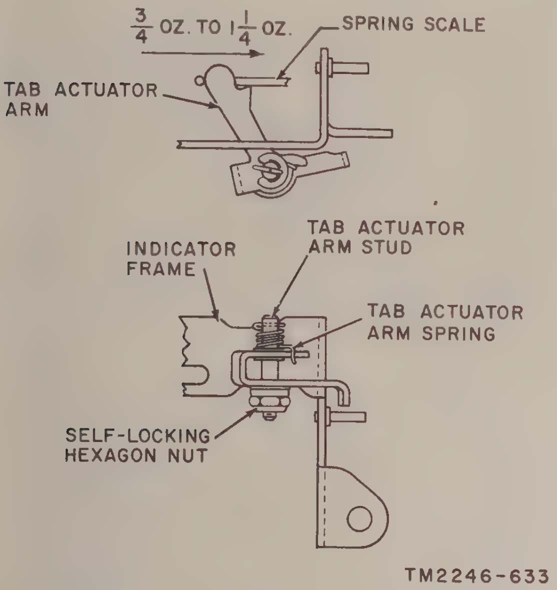


Figure 382. Tab actuator arm spring adjustment.

396. Line Indicator Adjustments

(fig. 383)

a. Clearance Adjustment.

(1) *Requirement.* There should be .003- to .010-inch clearance between the E-ring and the bearing.

(2) *Adjustment.* Remove the E-ring next to the laminated spacer. Peel the laminated spacer to meet the requirement. Replace the E-ring and recheck the clearance.

b. Spring Adjustment.

(1) *Requirement.* The indicator carriage should return to the left-hand margin from one space out when the carriage return is selected. It should require 4 to 5 ounces to rotate the ratchet one space.

(2) *Method of Checking.* Move the indicator carriage one space out. Select the carriage return; the indicator carriage should move to the left-hand margin.

(3) *Adjustment.* Remove both E-rings on the right-hand side and move the line indicator drive shaft to the right. Hold the indicator drive spring while moving the line indicator drive shaft. Rotate the indicator return spring housing clockwise to increase the spring tension and counterclockwise to decrease the spring tension. Replace the line indicator drive shaft and indicator return spring housing, making sure the tab on the indicator return spring housing goes into the slot on the bracket to prevent the indicator return spring housing from turning. Replace the E-rings and recheck the tension.

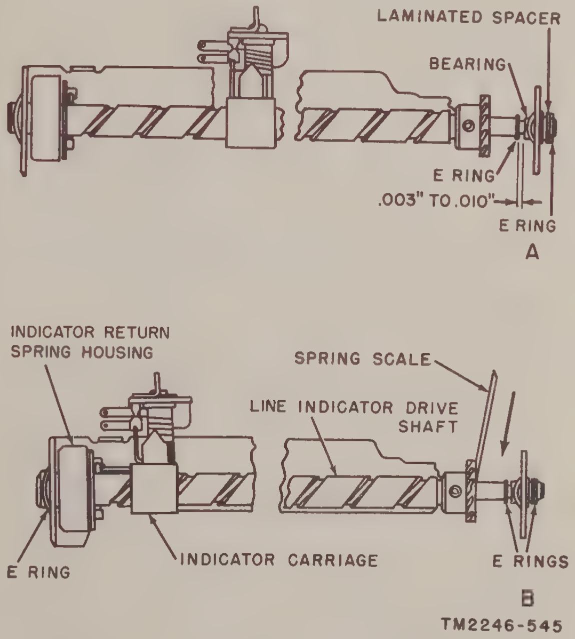


Figure 383. Line indicator return adjustments.

397. Cam Arm Adjustment

(fig. 384)

a. Requirement. There should be a .010- to .040-inch clearance between the XMTR camshaft and the cam stop lever when the XMTR lock solenoid (L1) is energized and the motor is running.

b. Method of Checking. Place the keyboard control switch in the TAPE position to energize

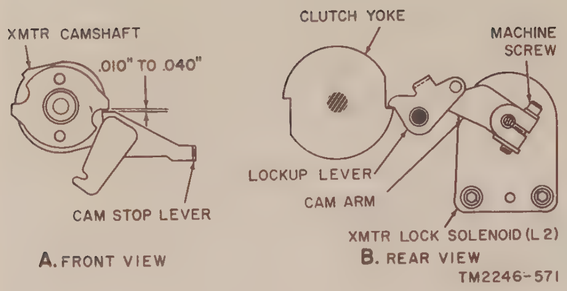


Figure 384. Cam arm adjustment.

the XMTR lock solenoid. Rotate the camshaft by hand until it is stopped by the lockup lever. Then turn on the motor and check the clearance between the XMTR camshaft and the cam stop lever with a feeler gage.

c. *Adjustment.* Turn off the motor. Loosen the machine screw and position the cam arm on the XMTR lock solenoid shaft to meet the requirement; tighten the machine screw. Turn on the motor and check as outlined in *b* above. Refer to paragraph 414 for related adjustment.

398. Universal Bar Adjustment

(fig. 385)

a. *Requirements.* There should be .005- to .015-inch clearance between the cam-stop lever and the locking lever latch when any key lever or space bar is in the depressed position.

b. *Adjustment.* Loosen the locknut and turn the universal bar adjusting screw in or out to meet the requirement; tighten the locknut.

399. Ratchet Wheel and Ratchet Detent Adjustment

(fig. 386)

a. *Requirement.* There should be .005- to .010-inch clearance between the ratchet wheel and the ratchet wheel detent when the indicator carriage is all the way to the left, with maximum clearance of .025-inch between the ratchet wheel and line indicator drive shaft.

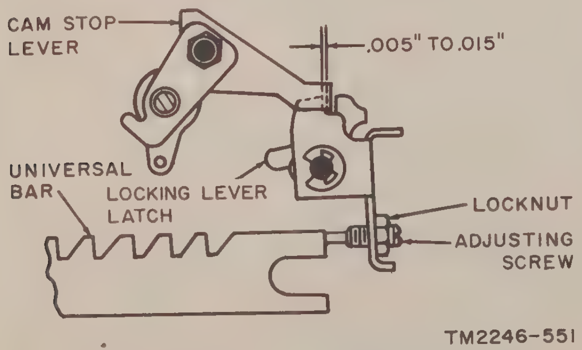


Figure 385. Universal bar adjustment.

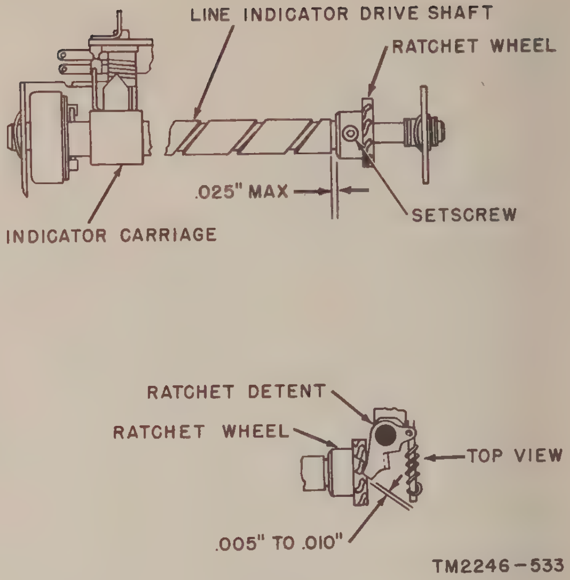


Figure 386. Ratchet wheel and ratchet wheel detent adjustment.

b. *Method of Checking.* With the indicator carriage all the way to the left, check the clearance between the ratchet wheel detent and the ratchet wheel with a feeler gage. Check the clearance between the ratchet wheel and shoulder on the line indicator drive shaft with a feeler gage.

c. *Adjustment.* Loosen the ratchet wheel setscrews and slide the ratchet wheel on the line indicator drive shaft to meet the .025-inch maximum clearance, and rotate the ratchet wheel until .005- to .010-inch clearance is obtained. Tighten the setscrews and recheck the clearance.

400. Restoring Solenoid Adjustment (L1)

(fig. 387)

a. *Requirement.* There should be .005- to .010-inch clearance between the ratchet wheel tooth and the ratchet wheel detent when the restoring solenoid is energized and the link arm assembly is stopped by the stop plate.

b. *Method of Checking.* Energize the restoring solenoid and check the clearance with a feeler gauge.

Note. To energize the restoring solenoid (L1), have the power on and the motor off. Turn the transmitter shaft slowly until the restoring solenoid becomes energized.

c. *Adjustments.* With the restoring solenoid

(L1) bracket in the approximate center of its elongated adjusting slot, loosen the indicator frame mounting screw and raise or lower the indicator frame to obtain one sixty-fourth of an inch travel before the ratchet pawl engages the ratchet wheel. Tighten the indicator frame mounting screw. Loosen the two nuts that hold the stop plate and the two nuts that hold the spring. Slide the spring up so that it does not contact the ratchet pawl. Loosen the stop plate mounting stud that holds the restoring solenoid mounting bracket and slide the restoring solenoid mounting bracket to its extreme counterclockwise position. Tighten the stop plate mounting studs. Energize the restoring solenoid (L2). Position the stop plate against the link arm assembly to obtain the .005- to .010-inch clearance between the ratchet wheel tooth and the ratchet wheel detent. Adjust the spring as described in paragraph 401. Check and readjust, if necessary, paragraph 407.

Caution: The restoring solenoid cannot be energized more than 5 minutes at one time. To energize the restoring solenoid, have the power on and the motor off. Turn the XMTR camshaft slowly until the restoring solenoid becomes energized.

401. Ratchet Pawl Leaf Spring Adjustment (fig. 387)

a. Requirement. It should require a pull of 10 to 12 ounces to start the end of the spring moving when the restoring solenoid (L1) is energized.

b. Adjustment. Loosen the nuts and energize the restoring solenoid (L1). Position the spring up or down to meet the requirements. Tighten the nuts.

Caution: The restoring solenoid cannot be energized more than 5 minutes at one time. To energize the restoring solenoid, have the power on and the motor off. Turn the XMTR camshaft slowly until the restoring solenoid becomes energized.

402. Carriage-Return Latch Lever Adjustment (fig. 388)

a. Requirement. The tab actuator arm must engage the carriage return latch lever just before the cam-stop lever (fig. 385) moves clockwise.

b. Method of Checking. With the indicator carriage five or more spaces out, push the carriage return and at the same time hold the indicator carriage from moving back. Visually check for the requirement.

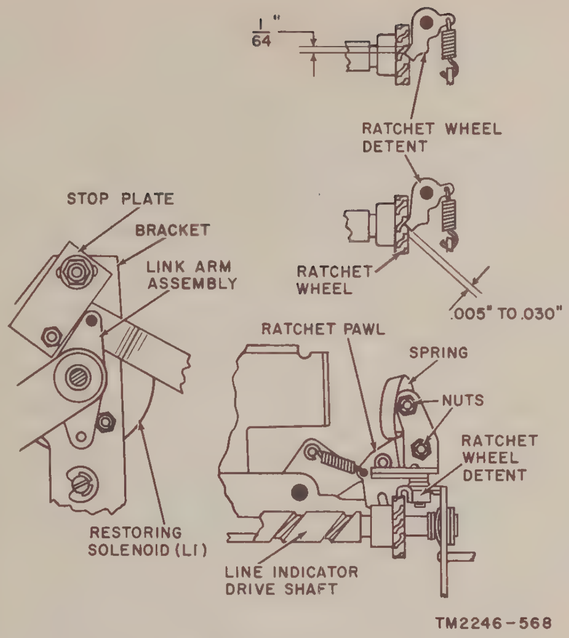


Figure 387. Restoring solenoid and feed pawl stop plate adjustments.

c. Adjustment. Loosen the adjusting nut and slide the carriage return latch lever on the carriage return blocking bar to meet the requirement; tighten the adjusting nut.

403. Carriage Return Blocking Arm Adjustment (fig. 389)

a. Requirement. There should be .010- to .020-inch clearance between the ratchet wheel detent and the ratchet wheel when the carriage return latch lever is in engagement with the tab actuator arm.

b. Method of Checking. With the indicator carriage at least five spaces away from the left, depress the carriage return key; at the same time, hold the indicator carriage to keep it from returning to the left. Check the clearance with the feeler gage. Release the indicator carriage and check for good engagement of the ratchet wheel detent with the ratchet wheel.

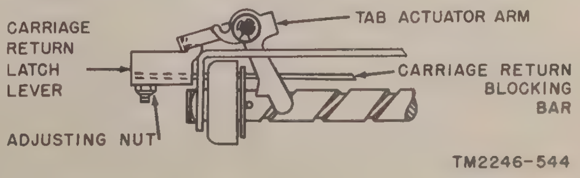


Figure 388. Carriage return latch lever adjustment.

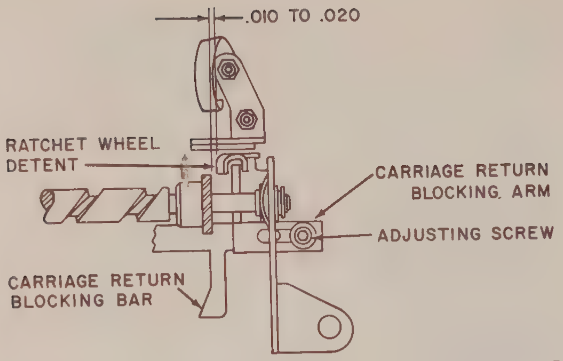


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Figure 389. Carriage return blocking arm adjustment.

c. Adjustment. Loosen the adjusting nut and slide the carriage return blocking arm on the carriage return blocking bar to meet the requirement; tighten the adjusting nut.

404. Function Blocking Arm Adjustment

(fig. 390)

a. Requirement. There should be some clearance not more than .005 inch between the function blocking arm and the ratchet pawl when the ratchet pawl is against the feed pawl stop lever.

b. Method of Checking. With the restoring solenoid energized, check the clearance between the ratchet pawl and the function blocking arm with a feeler gage.

c. Adjustment. Loosen the adjusting nut and slide the function blocking arm to meet the requirement. Be sure the function blocking bar is all the way to the left; tighten the adjusting nut.

Caution: The restoring solenoid cannot be energized more than 5 minutes at one time. To energize the restoring solenoid, have the power on and the motor off. Turn the XMTR camshaft slowly until the restoring solenoid becomes energized.

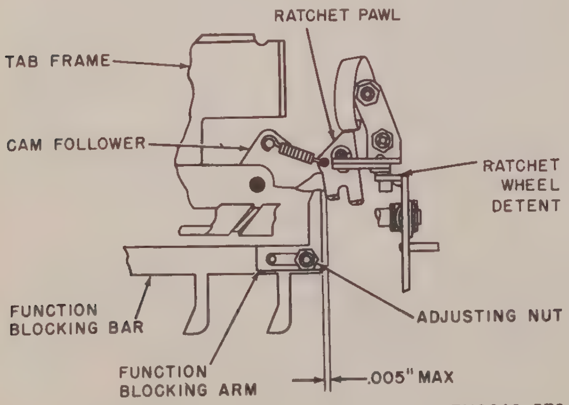

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Figure 390. Function blocking arm adjustment.

405. Lower Pulse Switch Adjustment

(fig. 391)

a. Requirement. Contacts should be open. In normal stop position the switch should remain open. There should be .010- to .020-inch minimum gap between contacts in open position. There should be .002- to .010-inch end play in cam-stop lever shaft.

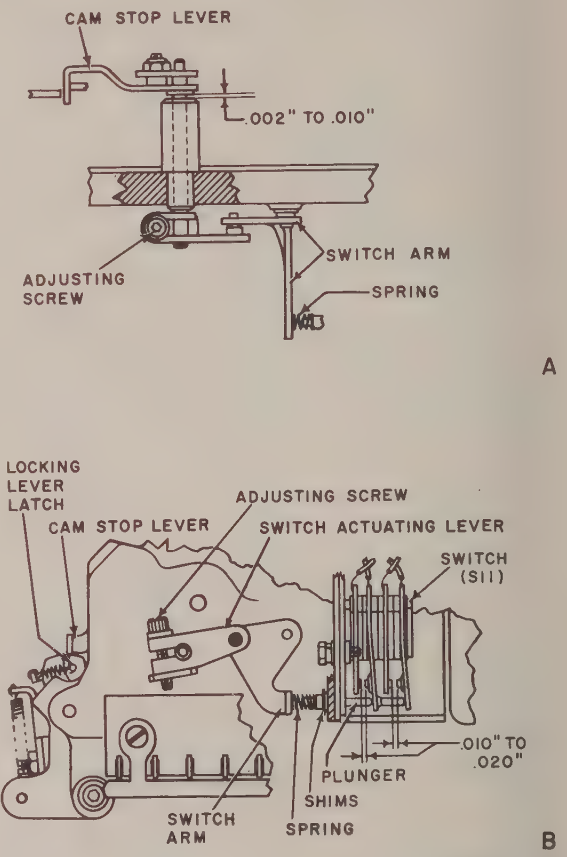

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Figure 391. Lower pulse switch adjustment.

b. Adjustment. Loosen adjusting screw. Insert a .007-inch feeler gage as shown in top view. Hold transmitter cam stop against locking lever latch; at the same time press latch against feeler. Rotate lever until contact gap of .010- to .020-inch is obtained; tighten adjusting screw and remove feeler.

406. Universal Bar Stop Screw Adjustment

(fig. 392)

a. Requirement. When the universal bar is to the left against the adjusting screw and the universal bar adjusting screw of the locking lever latch is against the universal bar, the upper edge of the locking lever latch should engage one-half the mating edge of the cam-stop lever.

b. Adjustment. Loosen the plain hexagonal nut of the universal bar bracket and position the adjusting screw to meet the requirement. Tighten the plain hexagonal nut.

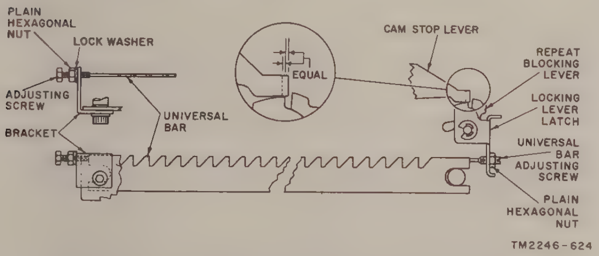


Figure 392. Universal bar stop screw adjustment.

407. Cam-Stop Lever Adjustment

(fig. 393)

a. Requirement. There should be .020- to .050-inch clearance between the cam-stop lever and repeat blocking lever when the restoring solenoid is energized.

b. Method of Checking. Energize the restoring solenoid and move the repeat blocking lever under the cam-stop lever. Check the clearance with a feeler gage.

c. Adjustment. Loosen the adjusting nut. Energize the restoring solenoid and move the repeat blocking lever under the cam stop lever. Place a feeler gage between the cam-stop lever and the repeat blocking lever, and pivot the stop latch cam follower until it just touches the camshaft. Tighten the adjusting nut and recheck the clearance.

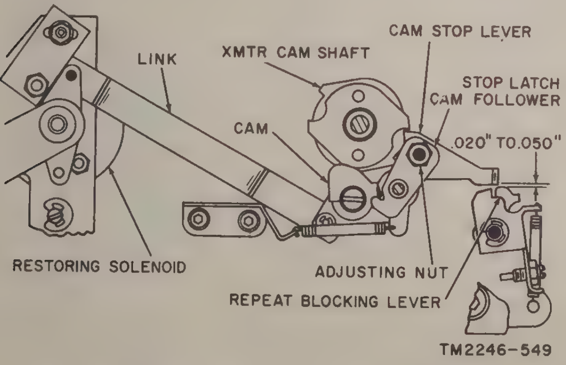


Figure 393. Cam-stop lever adjustment.

408. Tab Lever Shaft Adjustment

(fig. 394)

a. Requirement. The tab levers should move without binding.

b. Adjustment. Loosen the locknut on the cone point setscrew and turn the setscrew in or out until the tab levers move without binding and with a minimum amount of end play; tighten the locknut.

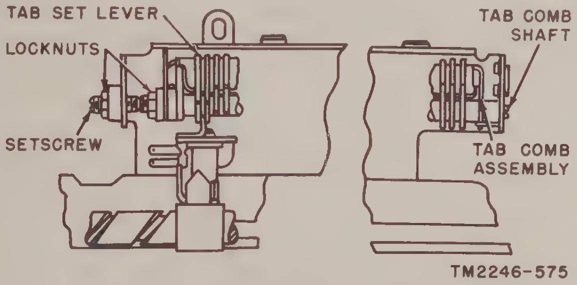


Figure 394. Tab lever shaft adjustment.

409. Tab Mounting Guide Adjustment

(fig. 395)

a. Requirement. The stop arm should be against the number 5 tab set lever when the indicator carriage has been spaced out five spaces and the tab mounting guide is in the operated position.

b. Adjustment. With the motor off, move the indicator carriage out five spaces. Push the number 5 tab set lever down. Loosen the locknut on the tab mounting guide shaft. Turn the tab mounting guide in operate (down) position while holding the locknut. Turn the tab mounting guide shaft with a screw driver until the require-

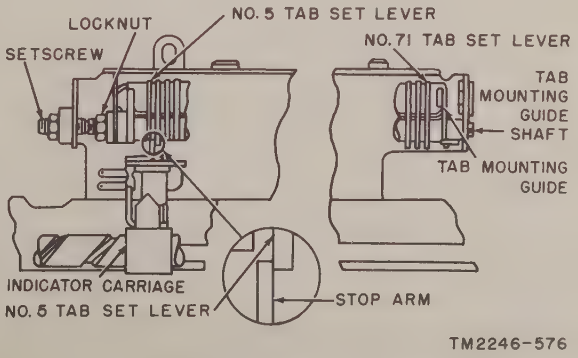


Figure 395. Tab mounting guide adjustment.

ment is met; tighten the lock nut. Check the number 71 tab set lever.

Note. The sliding contacts have to pivot in and make contact with the tab switch assembly when the indicator carriage is spaced out to the corresponding selected tab set lever and the repeat key is pushed down. Check at both ends of the tab mounting guide assembly.

410. Repeal Adjustment

(fig. 396)

a. Requirement. When the keyboard is locked up in a tab stop position, the keyboard must not repeat when the repeat key is raised slowly.

b. Method of Checking. With a tab set lever engaged and the tab contacts closed, slowly lift the repeat key. The repeat blocking lever must block the cam stop lever from falling off before the tab contacts disengage. (If the above does not happen the result is a repeat condition.)

c. Adjustment. Loosen adjusting screw. Set first five tab stops in the down position and space carriage out until it is beneath the five tabs. With a .050 feeler gage in position, as shown, take up end play of tabulator lever adjusting arm and tabulator lever in directions shown. Tighten adjusting screw.

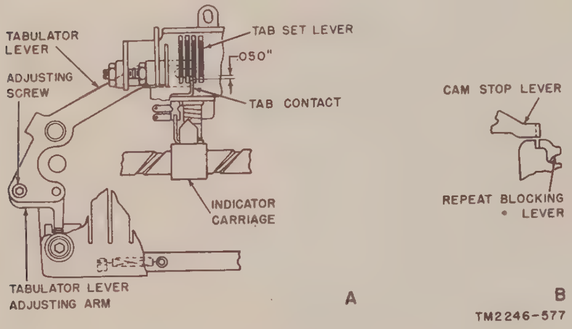


Figure 396. Repeat adjustment.

411. Upper Pulse Switch Adjustment

(fig. 397)

a. Requirement. With the keyboard counter cam follower on the high portion of the cam, contacts of the pulse switch should be closed with sufficient follow through to insure proper contact. Also, check for .010-inch minimum clearance between the contacts of the pulse switch when the keyboard counter cam follower is on the low portion of the cam.

b. Adjustment. With the keyboard counter cam follower on the high portion of the cam, loosen the nuts and turn the set screw until contacts of the pulse switch are just touching; then turn the set screw ½ turn clockwise and tighten the nuts. Check both high portions of the cam.

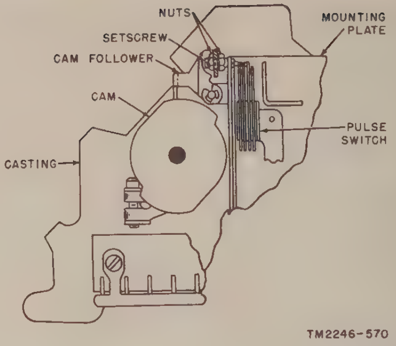


Figure 397. Upper pulse switch adjustment.

412. Switch Actuator Mechanism Adjustment

(fig. 398)

a. Requirement. There should be continuity through the switch (the end-of-line indicator lamp should light when the indicator carriage is spaced out to the 66th character.

b. Method of Checking. Space the indicator carriage out to the 66th character. Check the continuity through the switch. If the keyboard is on the machine and the power is on, the end-of-line lamp should be on.

c. Adjustment. With the indicator carriage at the 66th space, loosen the adjusting screw and slide the switch assembly to the right or left until continuity has just been made; tighten the adjusting screw. Space the indicator out to the 65th character; there should be no continuity through the switch. Space the indicator out to the 66th character; there should be continuity through the switch.

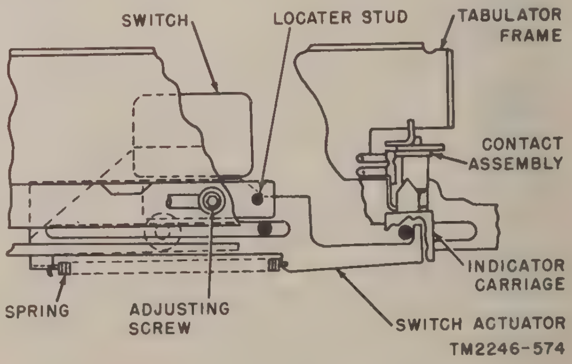


Figure 398. Switch actuator mechanism adjustment.

413. Indicator Cover Adjustment
(fig. 399)

a. Requirement. The indicator carriage should be pointed to *0* when the carriage is at the left-hand margin.

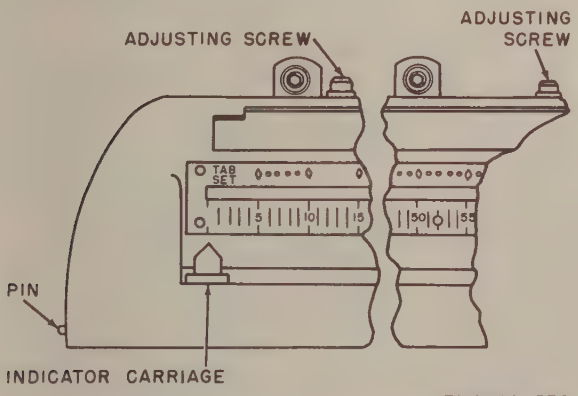


Figure 399. Indicator cover adjustment.

b. Adjustment. With the indicator carriage at the left-hand margin, loosen the two adjusting screws. Slide the indicator cover to the right or left until the indicator is at *0* on the cover; tighten the adjusting screws.

414. Transmitter Friction Clutch Adjustment
(fig. 400)

a. Requirement. It should require 25 to 30 ounces to keep the fork from turning when the motor is running.

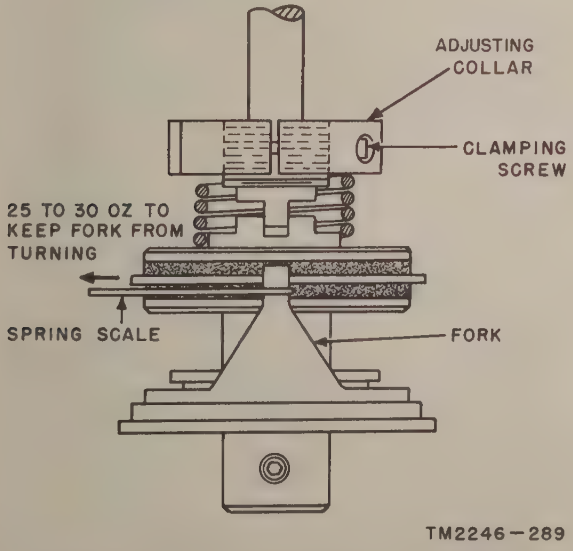


Figure 400. Transmitter friction clutch adjustment.

b. Method of Checking. With the motor on, hook a spring scale on the fork. Depress the space bar and read the scale.

c. Adjustment. With the motor off, loosen the clamping screw. Turn the adjusting collar in or out to meet the requirement; tighten the clamping screw. Turn the motor on and recheck the tension.

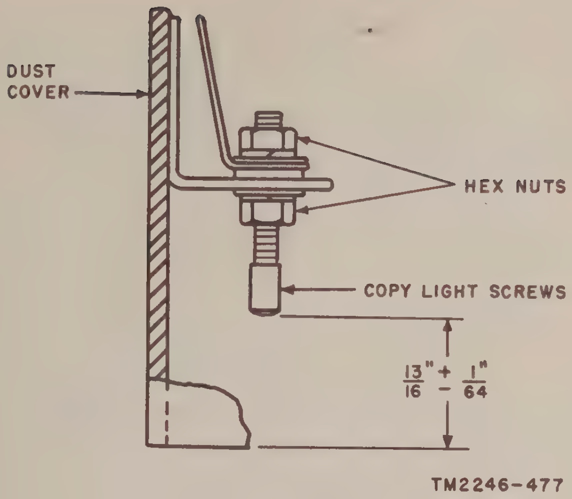


Figure 401. Dust cover copy light screws adjustment.

415. Dust Cover Copy Light Screws Adjustment
(fig. 401)

a. Requirement. There should be 13/16-inch, plus or minus 1/64-inch, between the bottom of the copy light screws and the bottom edge of the dust cover.

b. Adjustment. Loosen either the top or bottom hexagonal nuts and turn the copy light screws to meet the requirement; tighten the hexagonal nuts.

416. Dust Cover Window Door Adjustment
(fig. 402)

a. Requirement. The window door on the dust cover should close smoothly and be tight when closed.

b. Adjustments.

(1) Loosen the binding head screws and move the window latch until it is parallel (visually) with the edge of the dust cover and strikes the window catch approximately in the middle of the sloping surface; tighten the binding head screws.

(2) With the window door closed, loosen the socket head screws and slide the window latch until its edge just touches the window catch; tighten the socket head screws. Check by opening and closing

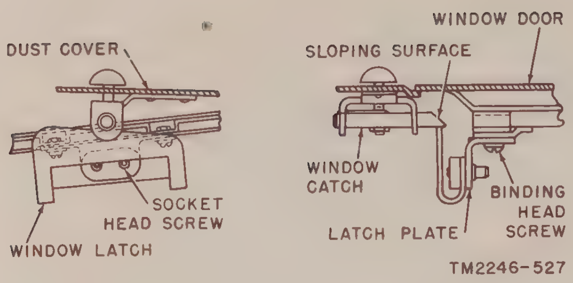


Figure 402. Dust cover window door adjustment.

the window door a few times and pulling up on the corners of the window door. If it does not operate smoothly or if the corners have excessive play, readjust.

417. Dust Cover Knob Adjustment

(fig. 403)

a. Requirement. There should be .002- to .012-inch clearance between the knob and the casting.

b. Adjustment. Loosen the adjusting screw and insert a feeler gage between the casting and the knob. Push the dust cover catch and knob towards each other until all clearance is removed. Tighten the adjusting screw and remove the feeler gage. Check to make sure the dust cover catch does not hit the casting when the knob is turned.

418. Manual Carriage Return Push Button Adjustment

(fig. 404)

a. Requirement. There should be enough clearance, but not to exceed 1/16 inch, between the push button and the push button lever to place the cover in its proper position over the machine without interference.

b. Adjustment. Loosen the locknut and turn the push button in or out until the requirement is met; tighten the locknut.

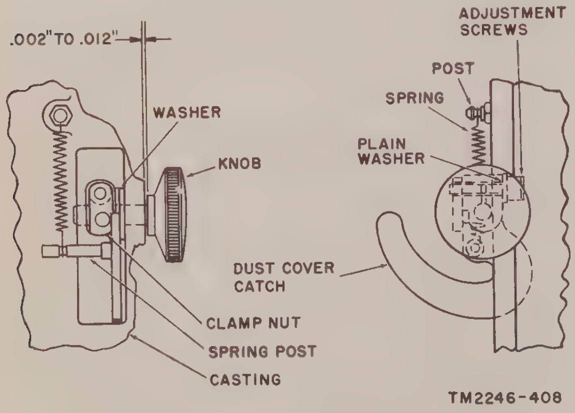


Figure 403. Dust cover knob adjustment.

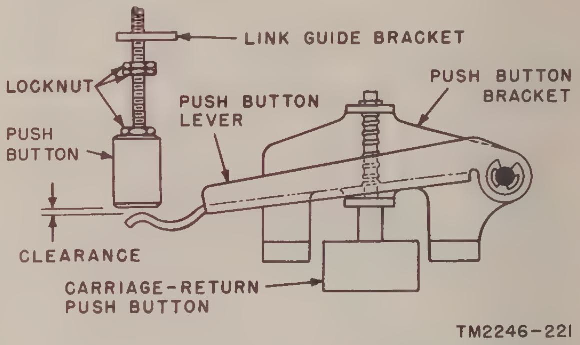


Figure 404. Manual carriage return push button adjustment.

419. Manual Letters Push Button Adjustment

(fig. 405)

a. Requirement. When the cover is put in position over the machine, the manual letters push button should clear the bell crank link button. When the manual letters push button is pressed, it should operate the platen latch.

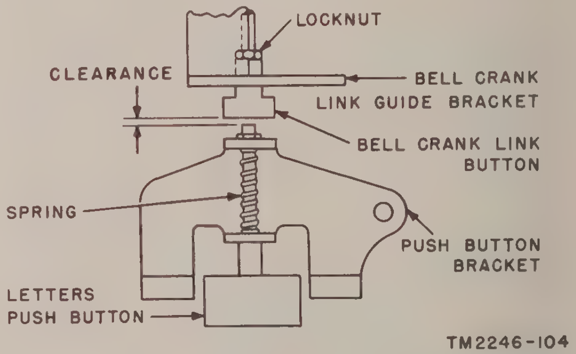


Figure 405. Manual letters push button adjustment.

b. Adjustment. Loosen the locknut and screw the bell crank link button in or out to meet the requirement; tighten the locknut. If difficulty is encountered in the operation of the platen latch when the letters push button is pressed, check the adjustment (par. 368).

Section VIII. PERFORATOR ADJUSTMENT PROCEDURES

420. General

This section contains requirements and adjustment procedures for the maintenance and optimum performance of perforator. Adjustments are arranged in sequence if a complete readjustment of a machine is undertaken. When making individual adjustments, check and perform, if necessary, all related adjustments. When removing items to make adjustment, refer to section V of this chapter.

421. Rangefinder Cam and Selector Lever Stop Comb Adjustment

(fig. 406)

a. Requirements.

(1) The selector levers should be centered visually with their corresponding Y levers.

(2) The dial must read 55 to 65 when the rangefinder cam high point is in line with the index mark on the rangefinder and comb bracket.

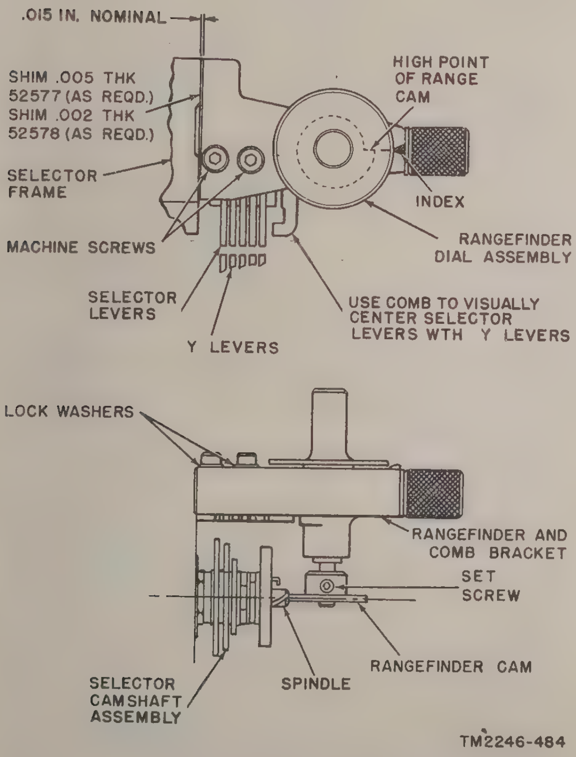

.015 IN. NOMINAL
SHIM .005 THK 52577 (AS REQD.)
SHIM .002 THK 52578 (AS REQD.)
SELECTOR FRAME
MACHINE SCREWS
SELECTOR LEVERS
Y LEVERS
HIGH POINT OF RANGE CAM
INDEX
RANGEFINDER DIAL ASSEMBLY
USE COMB TO VISUALLY CENTER SELECTOR LEVERS WTH Y LEVERS
LOCK WASHERS
RANGEFINDER AND COMB BRACKET
SET SCREW
RANGEFINDER CAM
SPINDLE
SELECTOR CAMSHAFT ASSEMBLY
TM2246-484

Figure 406. Rangefinder cam and selector lever stop comb adjustment.

b. Adjustments.

(1) Loosen the machine screws and position the selector lever stop comb to visually center the selector levers with the Y levers; tighten the screws. If selector lever stop comb cannot be adjusted to meet requirement, loosen the machine screws that hold the rangefinder bracket. Add or remove the shims to provide the desired clearance. Tighten the screws and recheck the clearance.

(2) Loosen the setscrews in the rangefinder cam. Center the rangefinder cam visually with the grooved pin in the selector camshaft assembly. Set the rangefinder dial assembly at 60 and tighten the knurled nut. Rotate the rangefinder cam until the high point is in line with the index mark; tighten the setscrews.

422. Selector Magnet Adjustments

The chart below gives the references for each of the individual adjustments related to the selector magnet assembly.

Adjustment	Par. ref	Fig. ref
Selector lever clearance adjustment	297	292
Armature and selector magnet bracket alinement	317	310
Armature stop bracket and bar magnet preliminary clearance	318	311
Selector magnet pole faces and armature alinement	319	312
Bar magnet attractive force and armature clearance adjustment	320	313
Bar magnet attractive force and leaf spring adjustment	321	314 and 315

423. Selector Lever and Stop Lever Alinement with Armature Blade (Preliminary)

(fig. 407)

a. Requirement. With a .004-inch clearance between the selector-magnet coil pole faces and the armature toffets, selector levers should just pass the knife edge of the armature blade. The stop lever should just engage the knife edge of the armature blade.

b. Adjustment. Place .004-inch feeler gages between the pole faces and the armature toffets.

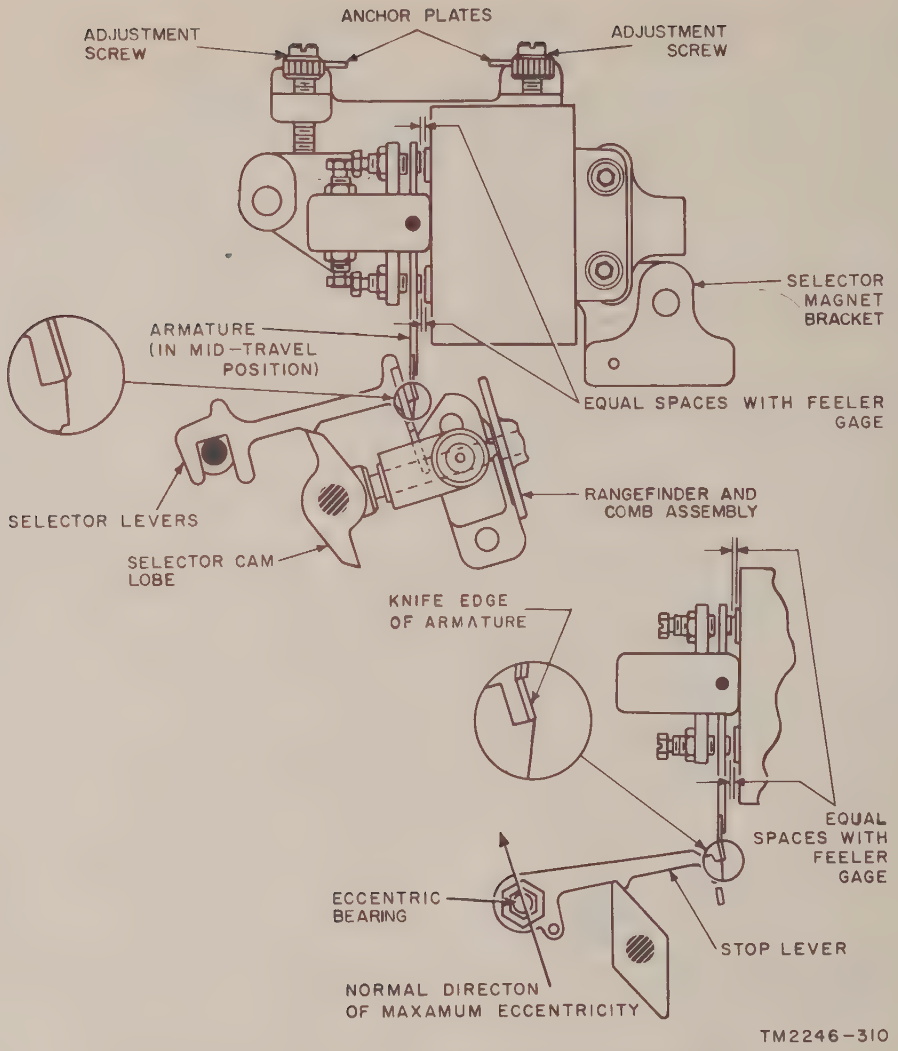

ADJUSTMENT SCREW
ANCHOR PLATES
ADJUSTMENT SCREW
SELECTOR MAGNET BRACKET
ARMATURE (IN MID-TRAVEL POSITION)
EQUAL SPACES WITH FEELER GAGE
RANGEFINDER AND COMB ASSEMBLY
SELECTOR LEVERS
SELECTOR CAM LOBE
KNIFE EDGE OF ARMATURE
EQUAL SPACES WITH FEELER GAGE
ECCENTRIC BEARING
STOP LEVER
NORMAL DIRECTON OF MAXAMUM ECCENTRICITY
TM2246-310

Figure 407. Selector levers and stop lever alignment with armature blade.

Place the selector magnet bracket on the unit and replace the selector magnet bracket mounting screws to exert friction to hold the selector magnet bracket to the casting. While manually moving the selector levers pass the armature blade, position the selector magnet adjustment screws until the requirement is met. Tighten the selector magnet bracket mounting screws. Loosen the eccentric bearing self-locking hexagonal nut and turn the stop lever eccentric bearing until the stop lever just engages the knife edge of the armature. Tighten the self-locking hexagonal nut while holding the eccentric bearing stationary. (Check related adjustments, paragraphs 319, 320, 321, and 425.)

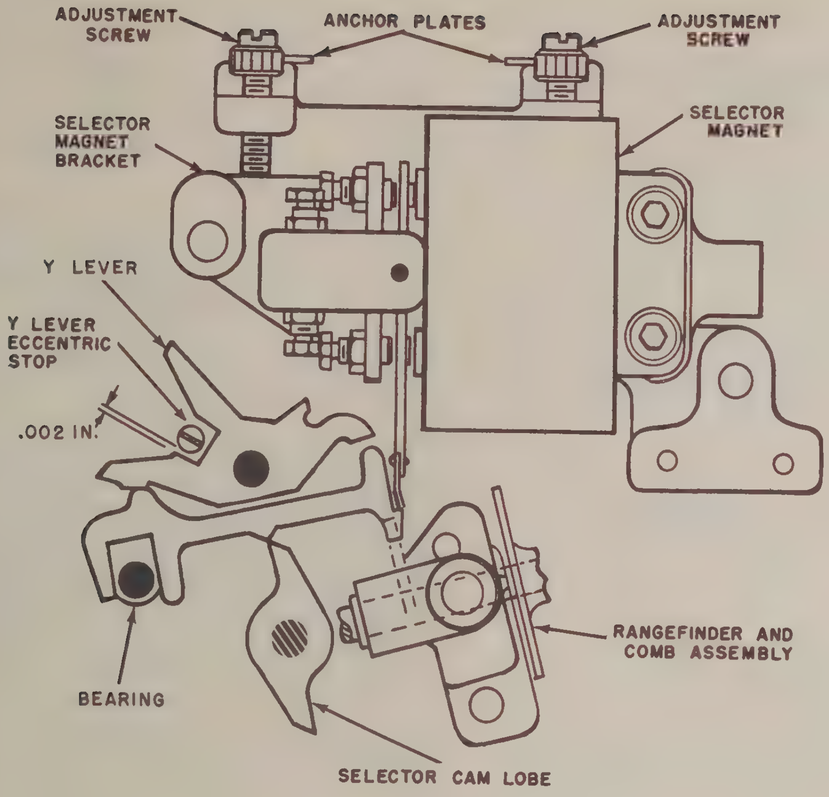
424. Selector Magnet Alinement with Selector Levers and Y-Levers

(fig. 408)

Note. This adjustment is to be made after adjustment paragraph 428.

a. Requirement. The selector camshaft should not rotate with a .006-inch feeler gage between the Y-lever and the bottom of the Y-lever eccentric stop when the letters code group is received by the selector mechanism and the motor is running. The selector camshaft should rotate when a .002-inch feeler gage is inserted at that position.

b. Adjustment. Adjust the selector magnet bracket adjustment screws until the above requirement is met.



TM2246-486

Figure 408. Selector magnet alinement with selector levers and Y-levers.

425. Selector Magnet Armature Blade and Selector Lever Clearance

(fig. 318)

a. Requirement. The gap between the armature blade and the selector levers should be between .015- and .020-inch.

b. Adjustment. Position the selector lever comb bracket vertically so that the requirement is met.

426. Y-Lever Detent and Y-Levers Adjustments

The chart below gives the references for the individual adjustments which are identical to the adjustments for the page printer.

Adjustment	Par. ref.	Fig. ref.
Y-lever detent end-play adjustment	314	307
Y-lever detents and Y-levers adjustment	315	308

427. Sequential Transfer Lever Shaft Adjustment

(fig. 409)

a. Requirement. The T-levers should be in line, visually, with the Y-levers.

b. Adjustment. With the rear collar loose, loosen the clamping screw of the front shaft collar and slide the transfer lever in or out to meet the requirement. Holding the transfer lever in position, slide the front shaft collar tight against the bearing and tighten the clamping screw. (Check related adjustments, paragraph 428.)

428. Sequential Transfer Lever Shaft End Play Adjustment

(fig. 410)

Note. This adjustment is to be made after adjustment paragraph 427.

a. Requirement. There should be .002- to .005-inch clearance between the rear collar and the rear

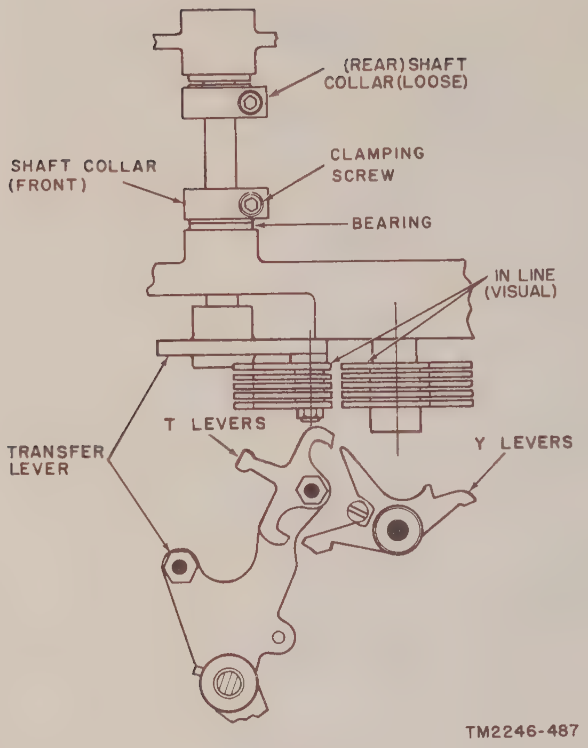


Figure 409. Sequential transfer lever shaft adjustment.

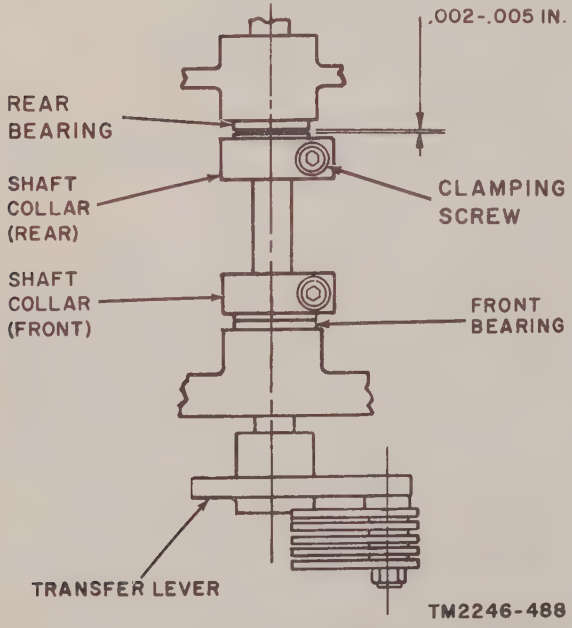


Figure 410. Sequential transfer lever shaft end play adjustment.

bearing when the front collar is tight against the front bearing.

b. Adjustment. Move the front tight against the front bearing. Loosen the clamping screw and slide the rear collar to meet the requirement and tighten the clamping screw.

429. T-Lever Stop-Bracket Adjustment

(fig. 411)

a. Requirement. There should be .005- to .015-inch clearance between the code plates and the T-lever stop bracket. The T-lever slots of the code plates should be equally alined in the T-lever stop bracket hole when an R- or Y-code combination is set up in code plates.

b. Adjustment. Insert a feeler gage between the first code plate and the T-lever stop bracket. Set up an alternate mark-space condition with the code plates and rotate the code actuated function shaft to move the register arm into the restraining notches of the code plates. Adjust the T-lever stop bracket so that any two adjacent T-lever slots are equally spaced, visually, in the T-lever stop bracket hole.

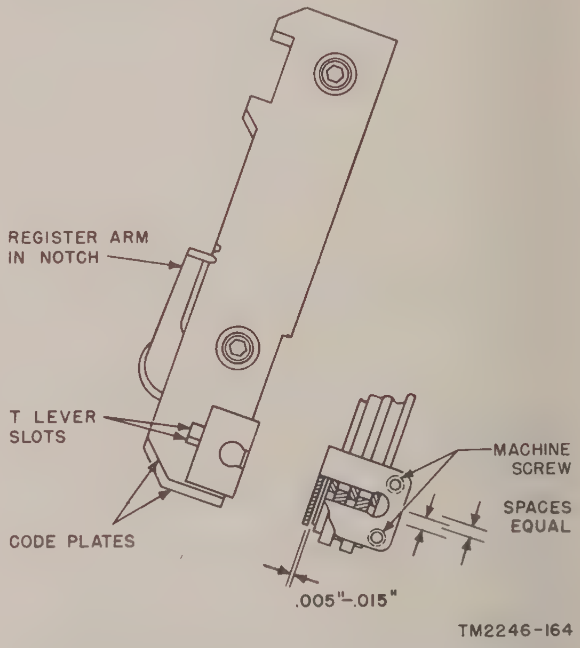


Figure 411. T-lever stop bracket adjustment.

430. Contact Wiper Guide Adjustment

(fig. 412)

a. Requirement. The contact wipers should be centrally positioned on the printed commutator rubbing surfaces.

b. Adjustment. Loosen the self-locking hexag-

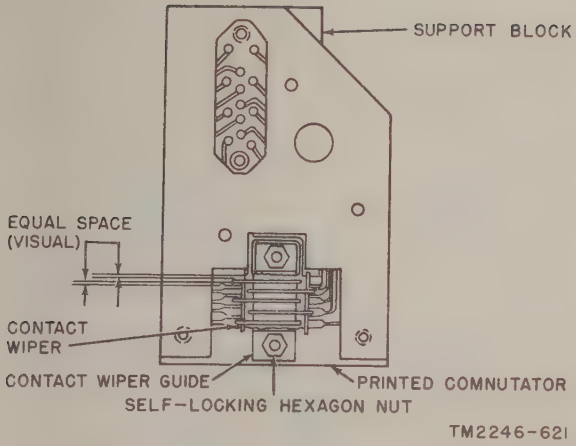


Figure 412. Contact wiper guide adjustment.

onal nuts and move the contact wiper guide to equally space the contact wiper on the printed commutator rubbing surfaces. Tighten the self-locking hexagonal nut.

431. Register Arm Adjustment

(fig. 413)

a. Requirement. There should be .020- to .035-inch clearance between the register arm and the code plate when the code actuated switch cam follower is in the detent position of the code actuated switch cam.

b. Adjustment. Loosen the register lever machine screw and position the register arm to meet the requirement. Tighten the machine screw.

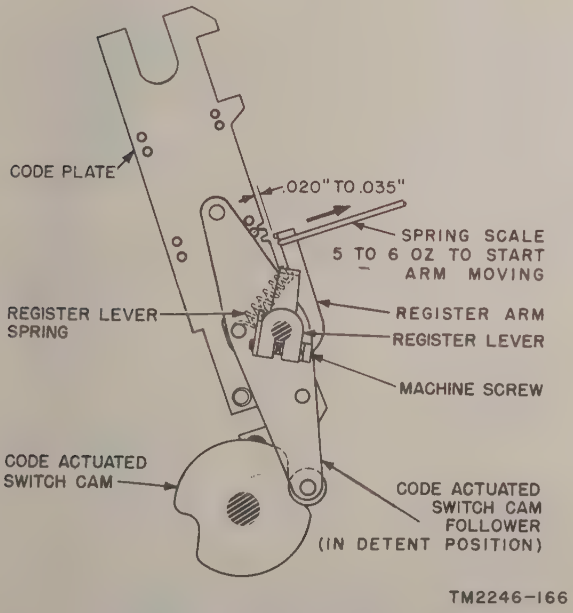


Figure 413. Register arm adjustment.

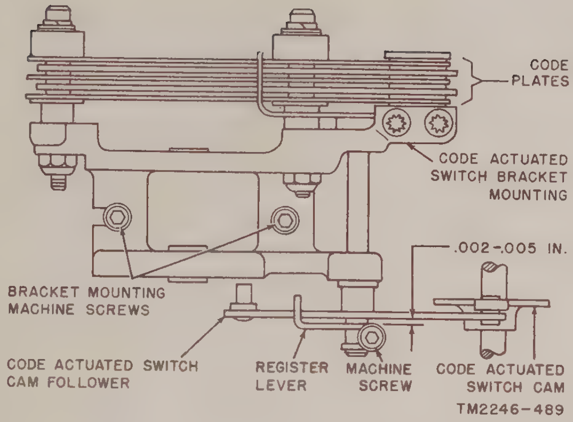

CODE PLATES
CODE ACTUATED SWITCH BRACKET MOUNTING
.002-.005 IN.
BRACKET MOUNTING MACHINE SCREWS
CODE ACTUATED SWITCH CAM FOLLOWER
REGISTER LEVER
MACHINE SCREW
CODE ACTUATED SWITCH CAM
TM2246-489

Figure 414. Register lever adjustment.

432. Register Lever Adjustment

(fig. 414)

a. Requirement. There should be .002- to .005-inch clearance between the register lever and the code actuated switch cam follower.

b. Adjustment. Loosen the machine screw in the register lever and slide the register lever to meet the requirement; tighten the machine screw.

433. Code Actuated Switch Bracket Mounting Adjustment

(fig. 415)

a. Requirement. The T-levers, when transferred, should have equal engagement with the Y levers and be in line, without binding, with the code bars. The register arm should drop smoothly into the notches.

b. Adjustment. Loosen the bracket mounting machine screws and set the Y-levers in alternate mark and space positions, as shown in figure 432. Release the transfer latch and move the code actuated switch bracket mounting so that the notches in the code plates are in line. Turn the motor by hand until the register arm drops into notches; the T-levers should have equal engagement with the Y-levers. Move the code actuated switch bracket mounting to adjust and to aline the code plates and T-levers; tighten the bracket mounting machine screws.

434. Printed Commutator Adjustment

(fig. 416)

a. Requirement. The contact wipers should be in line with the code plates. There should be an equal space between the contact wiper tips and the slot in the printed commutator when R or Y is selected from code group.

b. Method of Checking. Set the Y-levers in alternate mark and space positions and release the transfer lever by pulling the transfer lever latch downward. Turn the motor by hand until the register arm is in the notches of the code plates.

c. Adjustment. Loosen the machine screws and with the code plates in R or Y code group position and the register arm in the notches, position the printed commutator to meet the requirements. Tighten the machine screws.

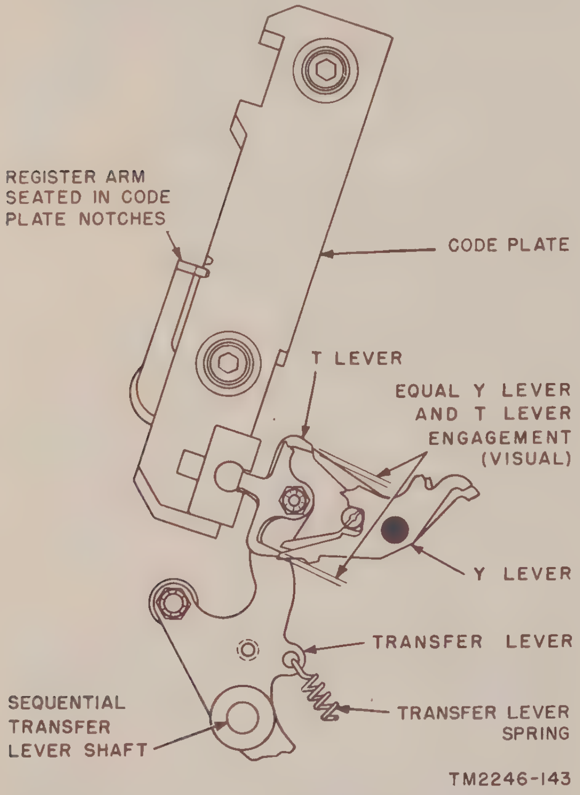

REGISTER ARM SEATED IN CODE PLATE NOTCHES
CODE PLATE
T LEVER
EQUAL Y LEVER AND T LEVER ENGAGEMENT (VISUAL)
Y LEVER
TRANSFER LEVER
SEQUENTIAL TRANSFER LEVER SHAFT
TRANSFER LEVER SPRING
TM2246-143

Figure 415. Code actuated switch bracket mounting adjustment.

435. Code Actuated Switch Function Shaft Adjustment

(fig. 417)

a. Requirement. The shoulder on the code actuated switch function shaft should be tight against the flat washer, and the transfer lever cam is to be tight against the opposite sides of the ball bearing.

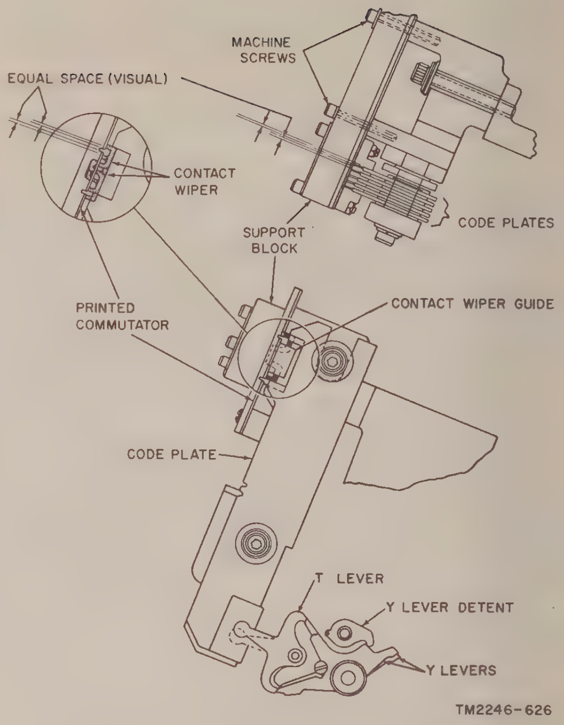


Figure 416. Printed commutator adjustment.

b. Method of Checking. Push and pull on the transfer lever cam and check for clearance between the transfer lever cam and the ball bearing.

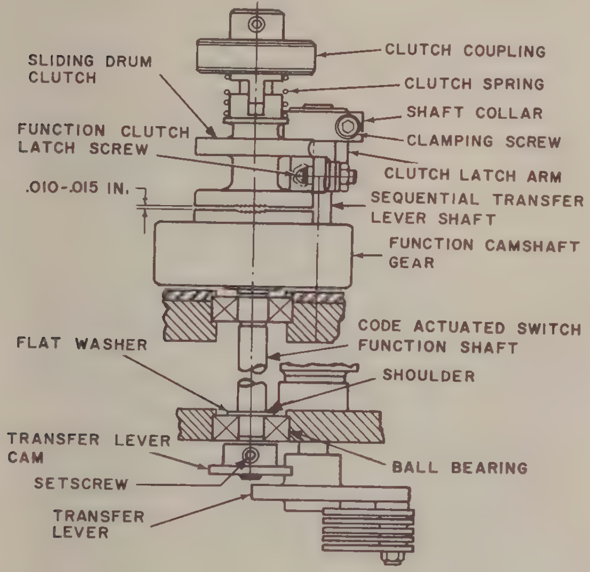
c. Adjustment. Loosen the transfer lever cam set screws and slide the code actuated switch function shaft until it pushes the flat washer tight against the ball bearing. Hold the code actuated switch function shaft and slide the transfer lever cam tight against the ball bearing; tighten the transfer lever cam set screws and check the requirement.

436. Code Actuated Switch Function Shaft Clutch Adjustment

(fig. 417)

a. Requirement. There should be .010- to .015-inch clearance between the sliding drum clutch and the function camshaft gear when the clutch latch arm is engaged by the sliding drum clutch.

b. Adjustment. Loosen the clamp screw in the shaft collar and loosen the function clutch latch screw in the clutch latch arm. Shift the position of the clutch latch arm on the sequential transfer lever shaft until the requirement is met. Slide the shaft collar up tight against the clutch latch arm and tighten only the clamping screw in the shaft collar so as to locate the position of the clutch latch arm. Adjust the code actuated switch function shaft clutch latch arm (par. 437).



TM2246-491

Figure 417. Code actuated switch function shaft adjustment.

437. Code Actuated Switch Function Shaft Clutch Latch Arm Adjustment

(fig. 418)

a. Requirement. There should be .008- to .012-inch clearance between the clutch latch arm and the sliding drum clutch when the clutch latch arm is disengaged.

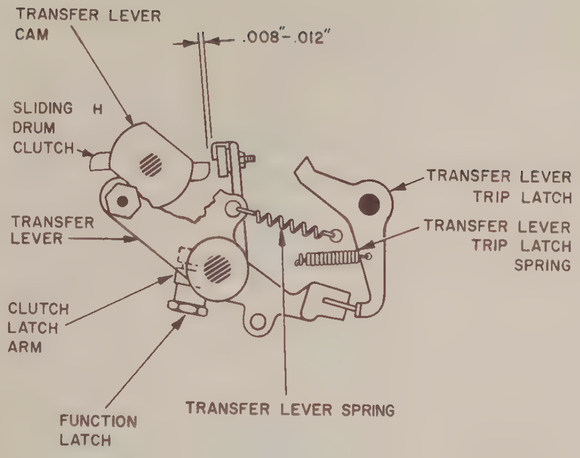
b. Method of Checking. With the transfer lever latched and the code actuated switch function shaft in the stopped position, trip the transfer lever by pulling the transfer lever latch down. The clutch latch arm then will be disengaged from the sliding drum clutch. Check the requirement with a feeler gage.

c. Adjustment. Loosen the function clutch latch screw in the clutch latch arm. Position the clutch latch arm to meet the requirement; tighten the function clutch latch screw.

438. Code Actuated Switch Cam Adjustment

(fig. 419)

a. Requirement. There should be .002- to .008-inch clearance between the sliding clutch drum finger and the function clutch latch arm when the code actuated switch cam follower is in an indent of the code actuated switch cam.

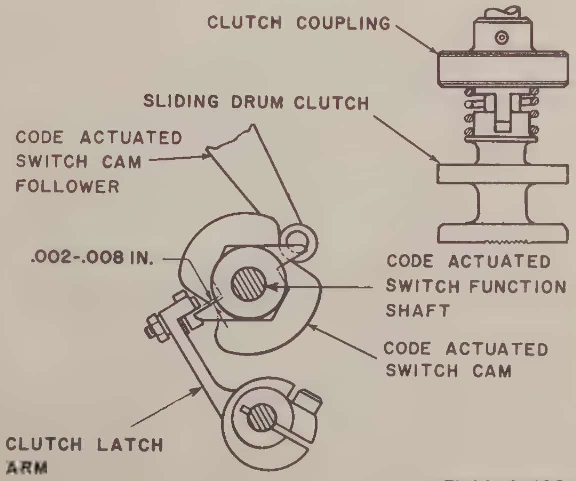


TM2246-194

Figure 418. Code actuated switch function shaft clutch latch arm adjustment.

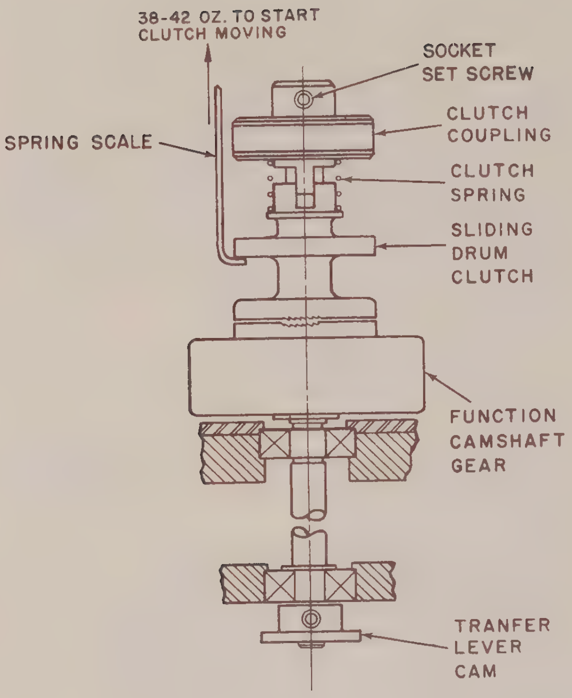
b. Method of Checking. Cause the code actuated switch function shaft to rotate under power from the motor. Cause the sliding drum clutch to engage the clutch latch arm by moving the selector magnet armature in the path of the stop lever. Turn the motor off and rotate the code actuated switch function shaft counterclockwise. Measure the clearance when the code actuated switch cam follower is in an indent of the code actuated switch cam.

c. Adjustment. With the machine in stop position, loosen setscrews of the code actuated switch cam. Be sure the code actuated switch cam fol-



TM2246-492

Figure 419. Code actuated switch cam adjustment.



TM2246-493

Figure 420. Code actuated switch function shaft clutch pressure adjustment.

lower is in the indent of the code actuated switch cam. Turn the code actuated switch function shaft to meet the required clearance; tighten the code actuated switch cam setscrews. Recheck the clearance; check both sides of the sliding clutch drum.

439. Code Actuated Switch Function Shaft Clutch Pressure Adjustment

(fig. 420)

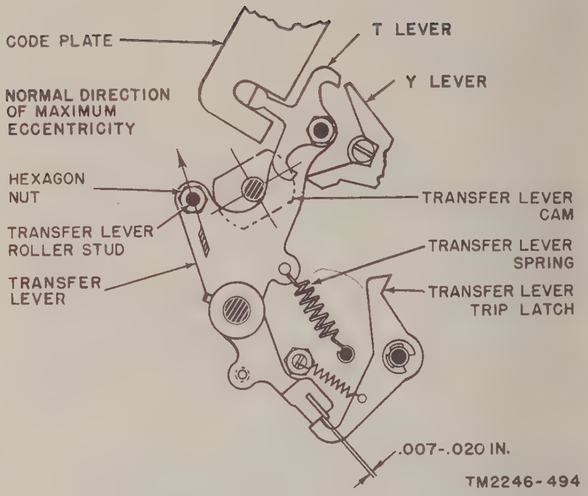
a. Requirement. It should require 38 to 42 ounces to just start the sliding drum clutch moving in the position shown in figure 437.

b. Adjustment. Loosen the socket setscrews in the clutch coupling and shift the clutch coupling in the proper direction to obtain the required spring tension for the sliding drum clutch; tighten the socket setscrews of the clutch coupling.

440. Sequential Transfer Lever Roller Stud Adjustment

(fig. 421)

a. Requirement. There should be .007- to .020-inch clearance between the transfer lever and the transfer lever trip latch when the transfer lever roller is on the high portion of the transfer lever cam.



TM2246-494

Figure 421. Sequential transfer lever roller stud adjustment.

b. Adjustment. Loosen the nut and set the transfer lever roller stud for maximum eccentricity. Manually rotate the code actuated switch function shaft until the roller is on the high portion of the transfer lever cam. Turn the transfer lever roller stud in either direction until the requirement is met. Tighten the nut and recheck the clearance.

441. Selector Camshaft Clutch Load Adjustment

(fig. 322)

a. Requirement. A pressure of 48 to 56 ounces should be required to start the camshaft rotating.

b. Method of Checking. Place the hook end of the spring scale on the stop plate retainer of the selector camshaft—pull the spring scale in excess of 56 ounces. Move the armature of the selector magnet to the space position, away from stop lever, and decrease the pull on the spring scale until the selector camshaft starts to rotate, read scale.

c. Adjustment. Loosen the clamping screw of the friction clutch adjusting collar and screw the friction clutch adjusting collar on the drive shaft collar to obtain the desired tension. Tighten the clamping screw.

442. Code Rings Actuating Load Adjustment

(fig. 422)

Note. The code-ring cage should be off of the unit to do this adjustment.

a. Requirement. A force of 12 ounces maximum should be required to move the code ring from mark to space position and from space to mark position.

b. Adjustment. Correct any burr on working surfaces of the cage. Replace distorted code rings with a new set.

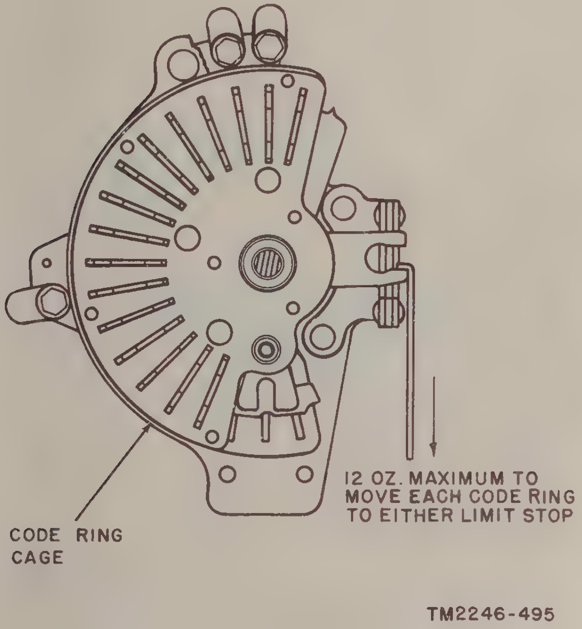


Figure 422. Code rings actuating load adjustment.

443. Sensing Levers Stacking Clearance Adjustment

(fig. 423)

a. Requirements.

(1) The code selecting guide plate hub should project not to exceed .003-inch beyond the type wheel reciprocating cam follower (fig. 4).

(2) The cam lever assembly hub should project not to exceed .003-inch beyond the sensing lever spacer.

b. Adjustments.

(1) Remove enough laminations from laminated spacer to meet the requirement specified in *a* (1) above.

(2) Remove enough laminations from sensing lever spacer to meet requirement specified in *a*(2) above. When checking, be sure no clearances are present between the sensing levers and spacers.

Note. Spacers are made of brass laminations bonded together. Each lamination is .022-inch thick. Recheck the adjustment requirements carefully to avoid removal of too many laminations. Use a knife blade to separate each lamination for removal.

444. Code Ring End Play Adjustment

(fig. 295)

a. Requirement. The clearance between the ball retainer and the code ring collar should be .002- to .004-inch.

b. Method of checking. Check the clearance by inserting a flat feeler gage from the bottom of the code ring cage between a code ring and a ball of the ball retainer.

c. Adjustment. Insert an Allen wrench through the top stop bars, through the hole in the code cage spacer into a set screw in the code ring collar. Loosen the set screws and move the code ring collar toward or away from the code ring to meet the requirement. Tighten the setscrews in the code ring collar and recheck the requirement. Recheck related adjustments described in paragraphs 307, 308, 316, 330, 331 and 332.

445. Stop Arm Shaft End Play Adjustment

a. Requirement. There should be .002- to .005-inch clearance between the stop arm shaft gear and the thrust bearing.

b. Adjustment. Loosen the two set screws and slide the stop arm shaft gear axially to meet the requirement; tighten the set screws.

446. Simultaneous Transfer Lever Adjustment

(fig. 424)

a. Requirement. The T-levers are to be in line with both the Y-levers and the code rings. Any offset should be equally divided so that the T-levers are centered between the Y-levers and the code rings.

b. Adjustment. With the rear shaft collar loose, loosen the clamping screw of the front shaft collar and slide the transfer lever in or out to meet the requirement. Holding the transfer lever in position, slide the front shaft collar tight against the bearing and tighten the clamping screw.

447. Simultaneous Transfer Lever Shaft End Play Adjustment

(fig. 425)

a. Requirement. There should be .002- to .005-inch clearance between the rear shaft collar and the rear bearing when the front shaft collar is tight against the front bearing and the socket head wrench can be inserted into the adjustment screw in the position shown.

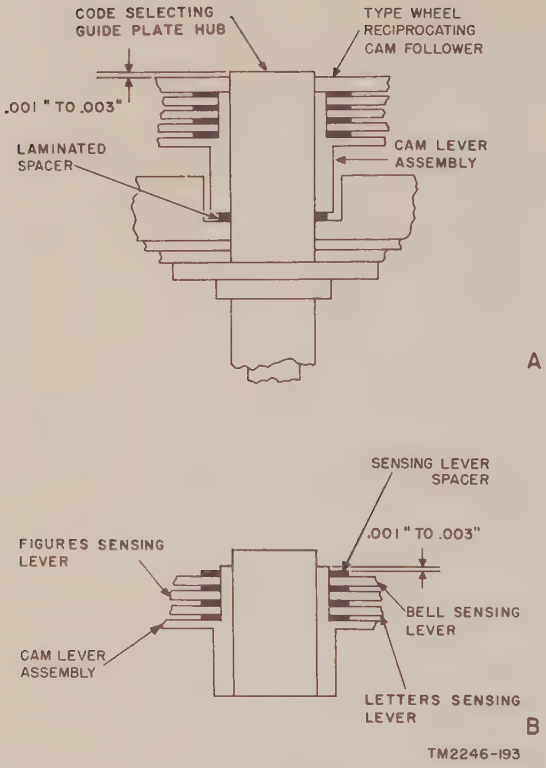


Figure 423. Sensing levers stacking clearance adjustment.

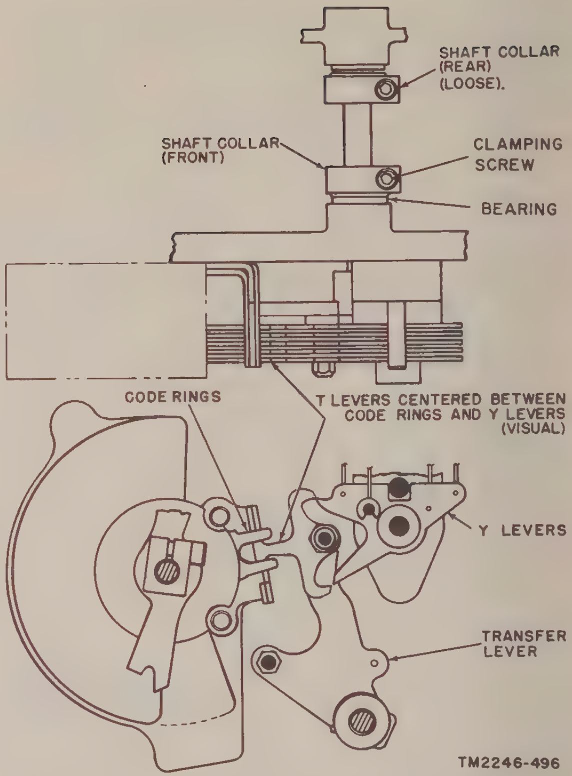

SHAFT COLLAR (REAR) (LOOSE).
SHAFT COLLAR (FRONT)
CLAMPING SCREW
BEARING
CODE RINGS
T LEVERS CENTERED BETWEEN CODE RINGS AND Y LEVERS (VISUAL)
Y LEVERS
TRANSFER LEVER
TM2246-496

Figure 424. Simultaneous transfer lever adjustment.

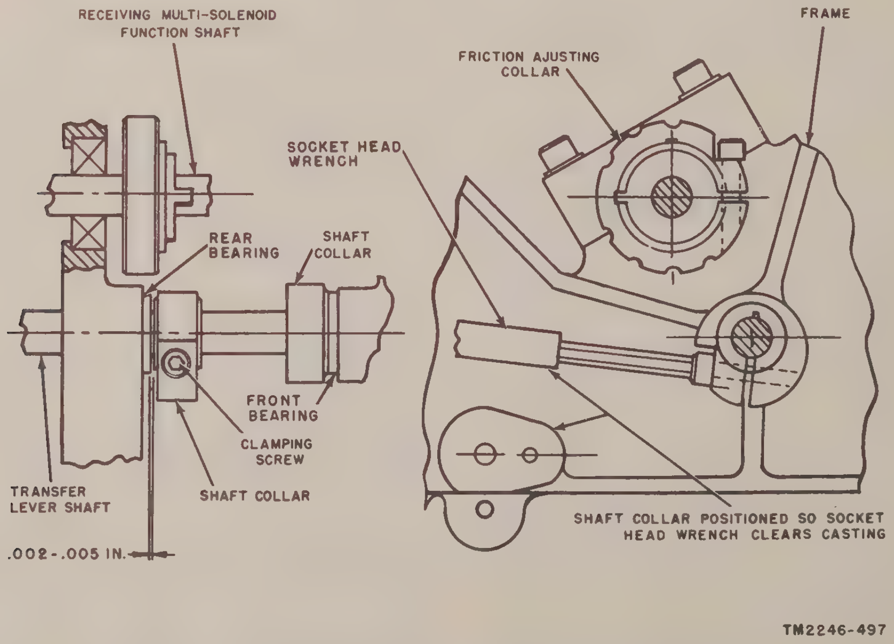


Figure 425. Simultaneous transfer lever shaft end play adjustment.

b. Adjustment. Loosen the clamping screw and slide the front shaft collar right against the front bearing. With a feeler gage between the rear shaft collar and the rear bearing, tighten the clamping screw in the position shown.

448. Multisolenoid Y-Levers Adjustment

(fig. 426)

a. Requirements.

(1) In the mark position, there should be a clearance of .001- to .004-inch between the Y-lever and the straight pin.

(2) In the space position, there should be a clearance of .001- to .004-inch between the Y-lever and straight pin.

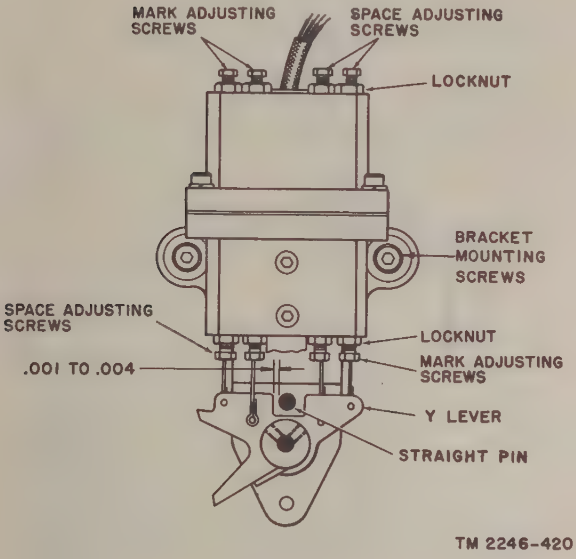


Figure 426. Multisolenoid Y-levers adjustment.

b. Adjustments.

(1) To decrease the clearance, loosen the locknut and back out the mark adjusting screw. To increase the clearance, loosen the locknut and run in the mark adjustment screw. When the requirement is met, tighten the locknut. Recheck and readjust if necessary.

(2) To decrease the clearance, loosen the locknut and back out the space adjusting screw. To increase the clearance, loosen the locknut and run in the space adjusting screw. When the requirement is met, tighten the locknut. Recheck and readjust, if necessary.

449. Multisolenoid Mounting Bracket Adjustment

(fig. 427)

a. Requirement. The T-levers should engage the Y-levers an equal amount for both mark and space positions of the Y-levers.

b. Method of Checking. With the transfer lever latched, set the No. 1 Y-lever in a mark position. Trip the transfer lever to cause the T-levers to engage the Y-levers. Visually check the amount of engagement. Reposition the transfer lever and the T-levers. Set the No. 1 Y-lever in a space position, trip the transfer lever, and visually check the amount of engagement.

c. Adjustment. Loosen the three multiselector bracket mounting screws and position the bracket until the requirement is met; tighten the mounting screws.

450. T-Lever Pivot Stud Adjustment

(fig. 427)

a. Requirement. There should be no clearance between the code-ring tails and their corresponding stops in either marking or spacing positions.

b. Method of Checking. With the transfer lever latched, set the Y-levers for either the R- or Y-code combinations. Then trip the transfer lever to cause the code rings to be shifted according to the Y-lever settings. Check the requirement visually.

c. Adjustment. Loosen the T-lever pivot stud locknut and position the T-lever pivot stud until the requirement is met; tighten the locknut. Recheck the multisolenoid mounting bracket adjustment (par. 449), readjust if necessary.

451. Function Plate and Stop Bars Clearance Adjustment

(fig. 428)

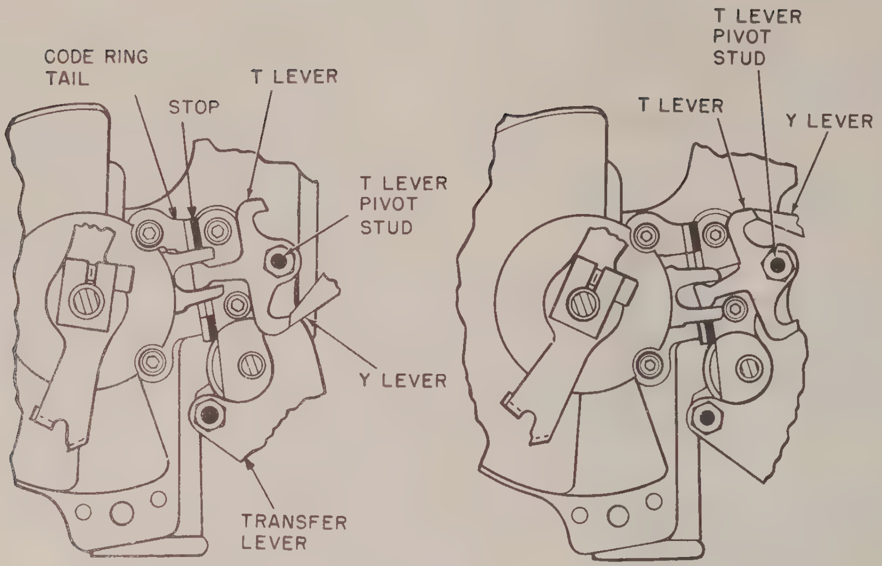
a. Requirement. There should be .001- to .010-inch clearance between the function plate and any of the three function stop bars.

b. Adjustment. Loosen the two mounting screws on the function plate. Turn the plate clockwise or counterclockwise until the requirement is met; tighen the mounting screws and recheck the requirement.

452. Function Sensing Levers Clearance Adjustment

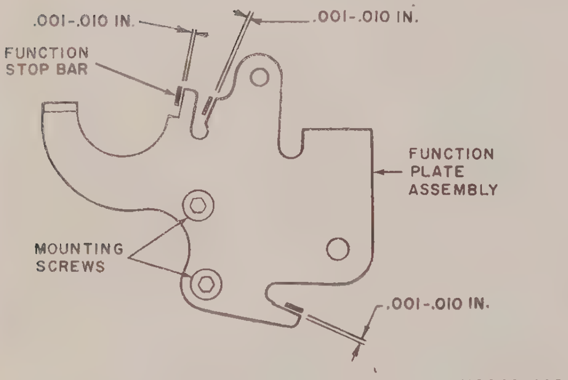
(fig. 429)

a. Requirement. There should be .015- to .030-inch clearance between the function stop bars and



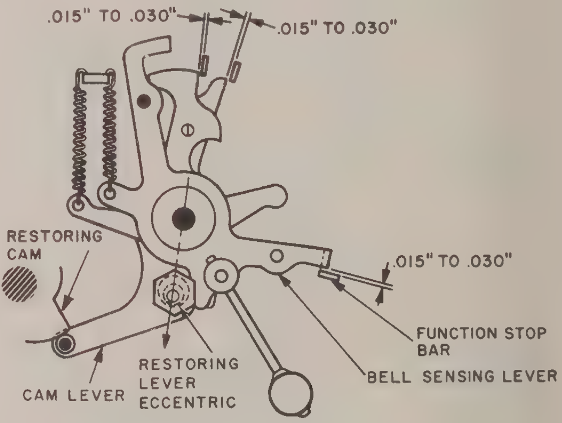
TM2246-498

Figure 427. Multisolenoid mounting bracket and T-lever pivot stud adjustment.



TM2246-499

Figure 428. Function plate and stop bars clearance adjustment.



TM2246—191

Figure 429. Function sensing levers clearance adjustment.

their associated sensing levers when the high point of the restoring cam is against the cam lever and none of the stop bars is in the selected positions.

b. Adjustment. Turn the motor by hand until the cam lever is against the high point of the restoring cam. Loosen the restoring lever eccentric locknut and turn the restoring lever eccentric until the requirement is met; tighten the locknut and recheck the clearance.

453. Function Stop Bars Adjustable Fulcrum Alinement

(fig. 430)

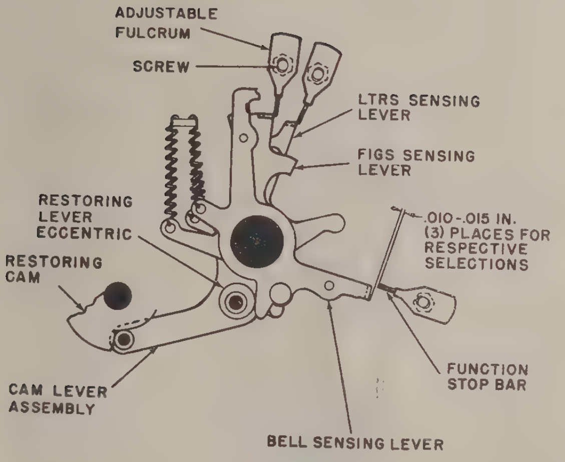
a. Requirement. There should be a .010- to .015-inch clearance between the tops of the function sensing lever and the associated stop bar when the cam lever is against the low point of the restoring cam and each function stop bar is individually moved to the selected position.

b. Adjustment. Loosen the hexagonal head screws and adjust each adjustable fulcrum to meet the requirement. Tighten the screws and recheck the clearance.

454. Transfer Lever Roller Stud Adjustment

(fig. 431)

a. Requirement. The transfer lever roller stud should be in the normal direction of maximum eccentricity.



TM2246-500

Figure 430. Function stop bars adjustable fulcrum alinement.

b. Adjustment. Loosen the nut and turn the transfer lever roller stud until the requirement is met; tighten the nut.

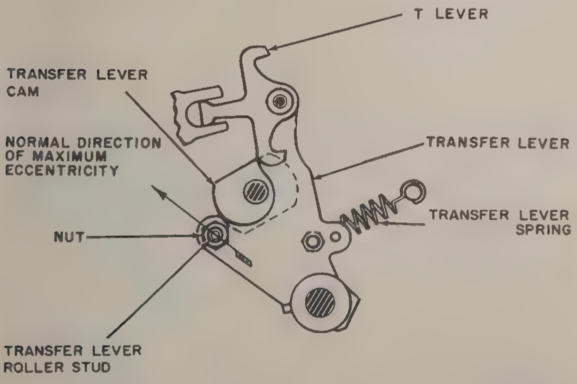
455. Receiver Multisolenoid Function Shaft End Play Adjustment

(fig. 432)

a. Requirement. The flat washer and the transfer lever cam should be tight against the opposite sides of the ball bearing.

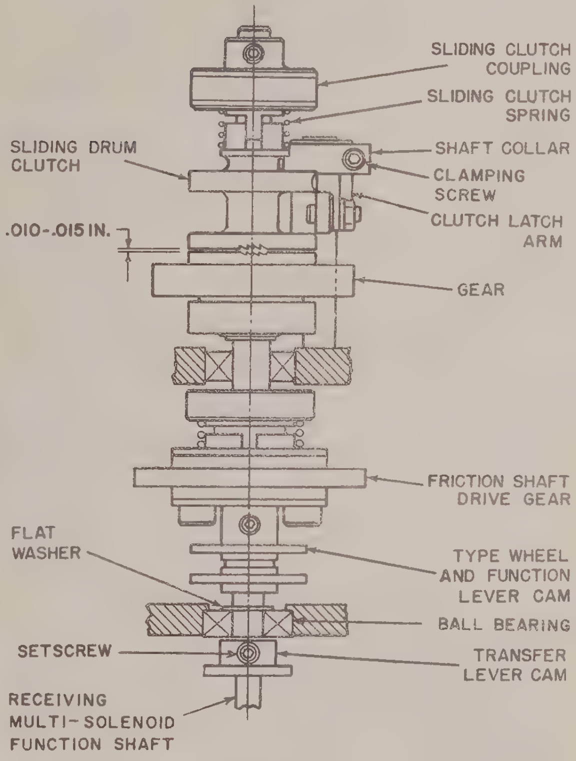
b. Method of Checking. Push and pull on the transfer lever cam and check for clearance between the transfer lever cam and the ball bearing.

c. Adjustment. Loosen the transfer lever cam setscrews and slide the receiving multisolenoid function shaft until it pushes the flat washer tight against the ball bearing. Hold the receiving multisolenoid function shaft and slide the transfer lever cam tight against the ball bearing. Tighten the transfer lever cam setscrews and check the requirement.


T LEVER
TRANSFER LEVER CAM
NORMAL DIRECTION OF MAXIMUM ECCENTRICITY
TRANSFER LEVER
TRANSFER LEVER SPRING
NUT
TRANSFER LEVER ROLLER STUD

TM2246-501

Figure 431. Transfer lever roller stud adjustment.



TM2246-503

Figure 432. Receiving multisolenoid function shaft end play and clutch adjustment.

456. Receiving Multisolenoid Function Shaft Clutch Adjustment

(fig. 432)

a. Requirement. There should be .010- to .015-inch clearance between the sliding drum clutch and the gear when the clutch latch arm is engaged by the sliding drum clutch.

b. Adjustment. Loosen the clamping screw in the shaft collar and loosen the hexagonal screw of the clutch latch arm. Shift the position of the clutch latch arm axially until the requirement is met. Slide the shaft collar up tight against the clutch latch arm and tighten only the clamping screw in the shaft collar so as to locate the position of the clutch latch arm. Adjust the clutch latch arm (par. 459).

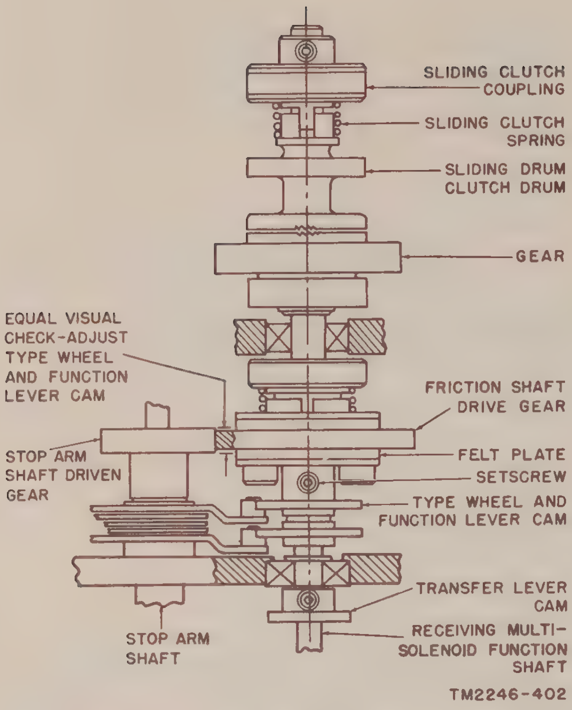

SLIDING CLUTCH COUPLING
SLIDING CLUTCH SPRING
SLIDING DRUM CLUTCH DRUM
GEAR
EQUAL VISUAL CHECK-ADJUST TYPE WHEEL AND FUNCTION LEVER CAM
FRICTION SHAFT DRIVE GEAR
STOP ARM SHAFT DRIVEN GEAR
FELT PLATE
SETSCREW
TYPE WHEEL AND FUNCTION LEVER CAM
TRANSFER LEVER CAM
RECEIVING MULTI-SOLENOID FUNCTION SHAFT
STOP ARM SHAFT
TM2246-402

Figure 433. Friction shaft drive gear alinement.

457. Friction Shaft Drive Gear Alinement

(fig. 433)

a. Requirement. The friction shaft drive gear on the receiving multisolenoid function shaft should be centered with the stop arm shaft driven gear.

b. Adjustment. Loosen the type wheel and function lever cam setscrews. While maintaining a pressure on the felt plate, move the type wheel and function lever cam to meet the requirement; tighten the setscrews.

458. Receiving Multisolenoid Function Shaft Clutch Pressure Adjustment

(fig. 434)

a. Requirement. It should require 38 to 42 ounces to just start the sliding drum clutch moving.

b. Adjustment. Loosen the screws in the sliding clutch coupling, shift the sliding clutch coupling in the proper direction to obtain the required tension for the clutch; tighten the sliding clutch coupling screws.

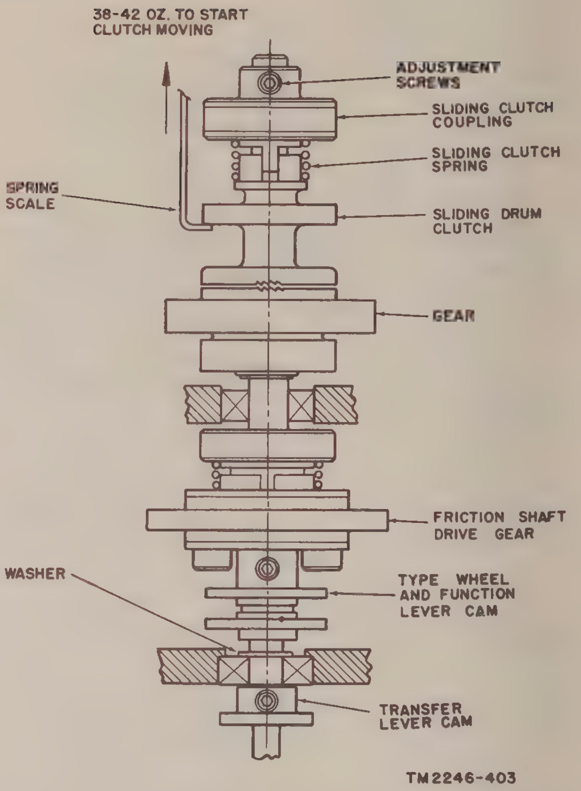


Figure 434. Receiving multisolenoid function shaft clutch pressure adjustment.

459. Clutch Latch Arm Adjustment

(fig. 435)

a. Requirement. There should be .008- to .012-inch clearance between the clutch arm latch and the sliding drum clutch when the clutch is engaged.

b. Method of Checking. With the clutch release lever latched and the long function shaft in the stopped position, trip the clutch release lever by moving the lever latch. The clutch latch arm then

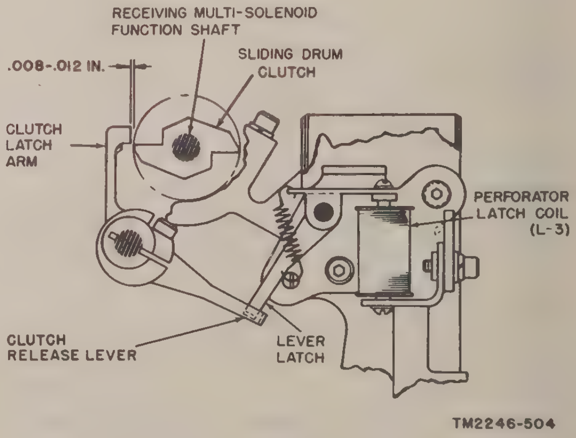


Figure 435. Clutch latch arm adjustment.

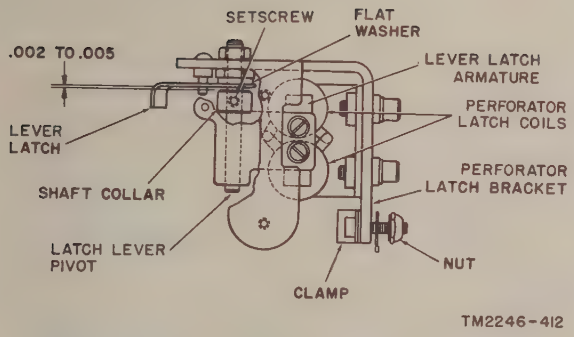


Figure 436. Lever latch shaft collar adjustment.

will be disengaged from the sliding drum clutch finger. Check the requirement with a feeler gage.

c. Adjustment. Loosen the clamping screw of the clutch latch arm. Position the clutch latch arm to meet the requirement; tighten the clamping screw.

460. Lever Latch Shaft Collar Adjustment

(fig. 436)

a. Requirement. There should be .002- to .005-inch clearance between the lever latch and the shaft collar.

b. Adjustment. Loosen the set screws in the shaft collar and insert a feeler gage between the shaft collar and lever latch. Slide the shaft collar until the lever latch is tight against the flat washer. Tighten the setscrews and remove the feeler gage.

461. Perforator Latch Coil Bracket Adjustment

(fig. 437)

a. Requirement. There should be .018- to .022-inch clearance between the lever latch armature and the perforator latch coils when the perforator latch coils are not energized and the lever latch is against the spring post.

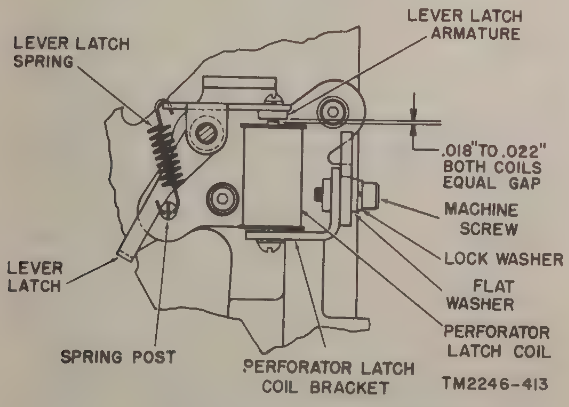


Figure 437. Perforator latch coil bracket adjustment.

b. Method of Checking. With the power off, check the gap between the lever latch armature and the perforator latch coils with a feeler gage.

c. Adjustment. Loosen the machine screws and, with a feeler gage inserted between the perforator latch coils and the lever latch armature, slide the perforator latch coil bracket to meet the requirement.

462. Clutch Release Lever Adjustment

(fig. 438)

a. Requirement. There should be .007- to .020-inch clearance between the clutch release lever and the lever latch when the transfer lever roller is on the high part of the transfer lever cam.

b. Adjustment. With the transfer lever roller on the high part of the transfer lever cam, loosen the clamping screw and rotate the clutch release lever until the requirement is met; tighten the clamping screw.

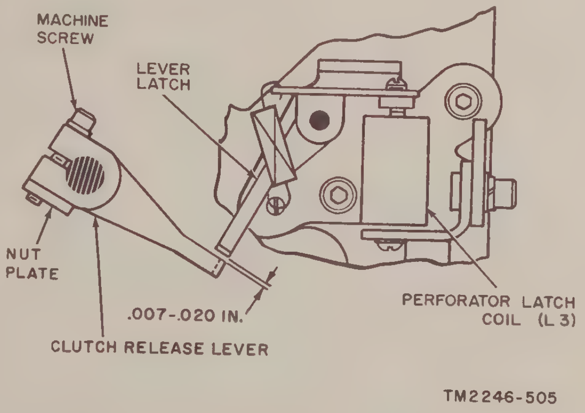


Figure 438. Clutch release lever adjustment.

463. Perforator Latch Bracket Adjustment

(fig. 439)

a. Requirement. There should be .005- to .012-inch clearance between the lever latch and the clutch release lever when the perforator latch coils are energized.

b. Method of Checking. With the perforator latch coils energized, check the gap between the lever latch and the clutch release lever with a feeler gage.

c. Adjustment. Loosen the machine screws and move the perforator latch bracket to make the adjustment.

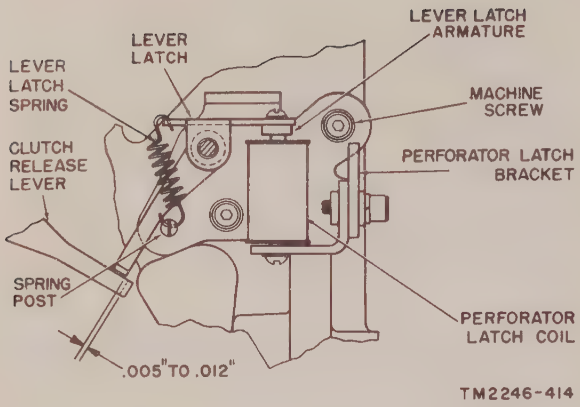


Figure 439. Perforator latch bracket adjustment.

464. Code Ring Locking Bail Adjustment

(fig. 440)

a. Requirement. When in the locking position, the code-ring locking bail should rest against the bottom of the locking notches in the code rings for both mark and space positions of the code rings.

b. Adjustment. Loosen machine screws in the code ring locking bail. Position the code ring locking bail until the requirement is met. Tighten the machine screws and recheck the requirement.

465. Code Ring Locking Bail Cam Follower Clearance Adjustment

(B, fig. 440)

a. Requirement. There should be a .015- to .025-inch clearance between the code ring locking bail and the high part of the code ring when the code ring locking bail cam follower is against the top of the cam stud.

b. Adjustment. With the code ring locking bail cam follower against the cam stud, loosen the cam follower screw and position the code ring locking bail cam follower to meet the clearance requirement. Tighten the cam follower screw and recheck the clearance.

466. Type Wheel Shift Levers End Play Adjustment

(fig. 441)

a. Requirement. There should be a .002- to .004-inch clearance between the retainer plate and the shaft collar when the levers of the lever assembly are held together.

b. Adjustment. Loosen the set screws in the shaft collar. Holding the levers together, position the shaft collar to meet the requirement; tighten the set screws. Recheck the clearance and readjust if necessary.

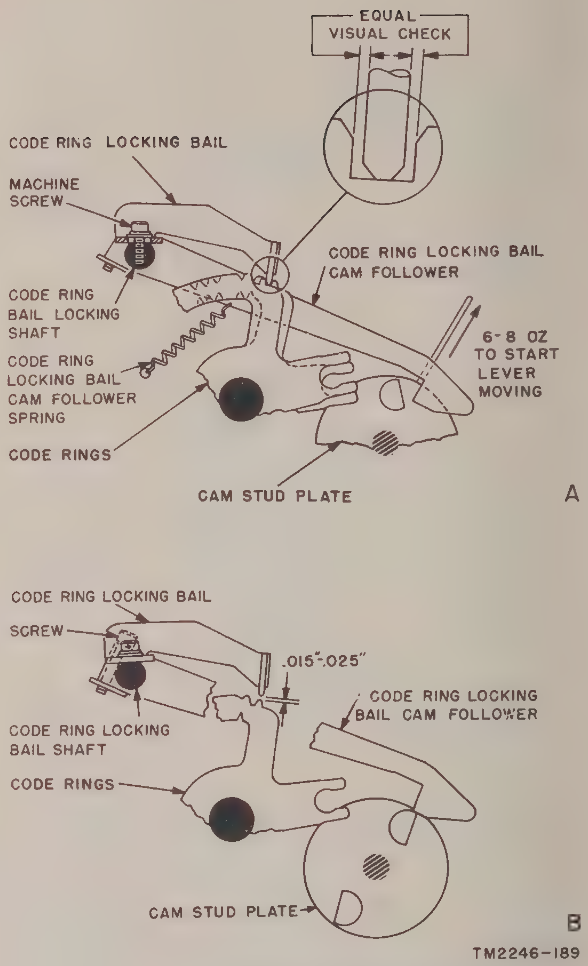

EQUAL VISUAL CHECK
CODE RING LOCKING BAIL
MACHINE SCREW
CODE RING LOCKING BAIL CAM FOLLOWER
CODE RING BAIL LOCKING SHAFT
6-8 OZ TO START LEVER MOVING
CODE RING LOCKING BAIL CAM FOLLOWER SPRING
CODE RINGS
CAM STUD PLATE
A
CODE RING LOCKING BAIL
SCREW
.015"-.025"
CODE RING LOCKING BAIL CAM FOLLOWER
CODE RING LOCKING BAIL SHAFT
CODE RINGS
CAM STUD PLATE
B
TM2246-189

Figure 440. Code-ring locking bail adjustment.

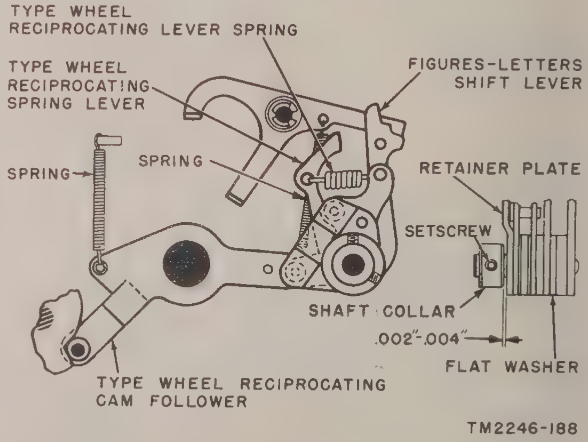

TYPE WHEEL RECIPROCATING LEVER SPRING
TYPE WHEEL RECIPROCATING SPRING LEVER
FIGURES-LETTERS SHIFT LEVER
SPRING
SPRING
RETAINER PLATE
SETSCREW
SHAFT COLLAR
.002"-.004"
FLAT WASHER
TYPE WHEEL RECIPROCATING CAM FOLLOWER
TM2246-188

Figure 441. Type wheel shift levers end play adjustment.

467. Signal Bell Clapper Adjustment

(fig. 442)

a. Requirement. The signal bell should ring with a clear tone when the S-code group is received while the machine is in the figures-shift position.

b. Adjustment. Loosen the setscrew in the bell sensing lever. Position the signal bell clapper approximately $\frac{3}{32}$-inch from the signal bell, until the requirement is met.

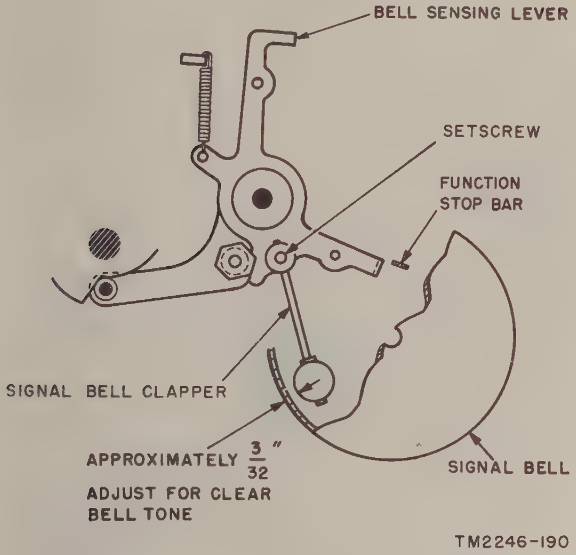


Figure 442. Signal bell clapper adjustment.

468. Stop Arm Bearing Brackets Adjustment

(fig. 443)

a. Requirement. The stop arm shaft should turn freely in its bearing brackets.

b. Adjustments.

(1) Loosen the setscrews of the type wheel driving gear. Loosen the stop arm bearing bracket screws. Loosen the square shaft stop arm clamping screw.

(2) Rotate the stop arm shaft slowly causing the type wheel hub to turn. If the stop arm shaft binds, position the front and rear stop arm bearing brackets until the stop arm shaft rotates freely. Tighten the four bearing bracket screws and recheck for bind.

(3) Replace the type wheel driving gear in accordance with paragraphs 443 and 457. Reposition the square shaft stop arm in accordance with paragraph 470.

469. Stop Arm Torque Adjustment

(fig. 444)

a. Requirement. With the motor running and the function shaft rotating, a pull of 12 to 17 ounces is required to hold the stop arm stationary.

b. Adjustment. With the motor off, loosen the clamping screw on the friction adjusting collar. Turn the friction adjusting collar in or out to meet the requirement; tighten the clamping screw and recheck the tension.

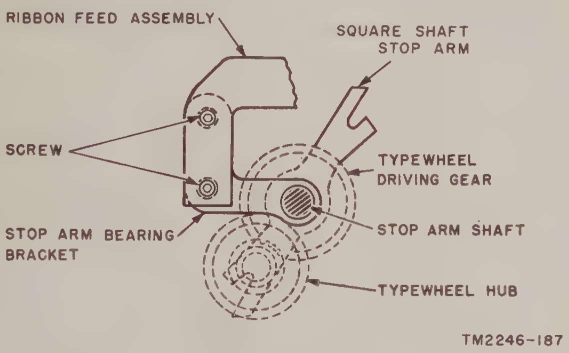


Figure 443. Stop arm bearing brackets adjustment.

470. Stop Arm and Register Wheel Alinement

(fig. 445)

a. Requirement. With the stop arm against the left side of the selected V-stop bar, the register lever should engage the fourth notch counterclockwise from the blank portion of the register wheel.

b. Adjustments.

(1) Operate the code rings manually, placing the first code ring in the space position and the other four in the mark position. This will allow the V-stop bar to be selected.

(2) Loosen the clamping screw in the stop arm. Manually turn the type wheel driving gear until the register lever engages the fourth notch counterclockwise from the blank portion of the register wheel. When this requirement is met, tighten the clamping screw.

471. Type Wheel and Register Wheel Alinement

(fig. 446)

a. Requirement. The letter V on the type wheel must be alined with the fourth notch counterclockwise from the blank portion of the register wheel.

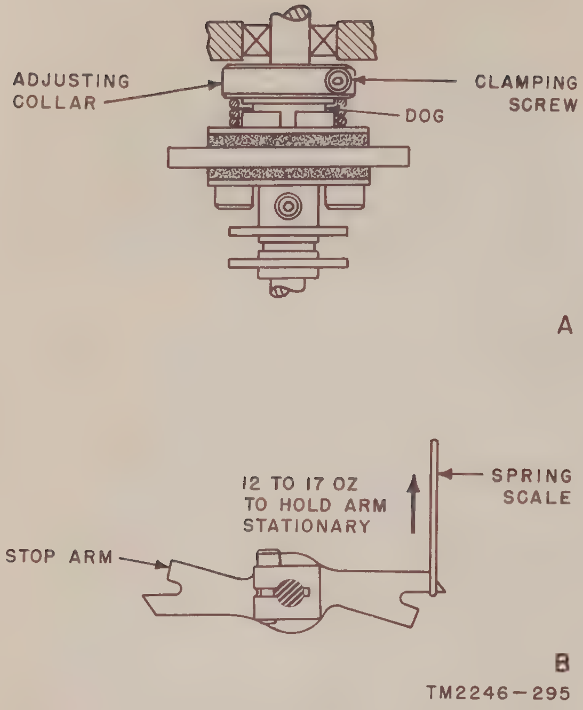


Figure 444. Stop arm torque adjustment.

b. Adjustment. Loosen the screws of the type wheel clamp plate mounting disk and turn the type wheel until the requirement is met; tighten the screws. The stop arm and register wheel must be alined (par. 470) before this adjustment is made.

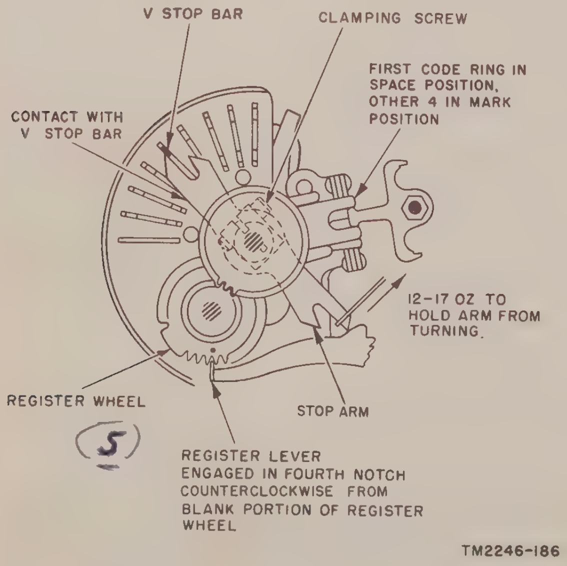

V STOP BAR
CLAMPING SCREW
FIRST CODE RING IN SPACE POSITION, OTHER 4 IN MARK POSITION
CONTACT WITH V STOP BAR
12-17 OZ TO HOLD ARM FROM TURNING.
REGISTER WHEEL
STOP ARM
(5)
REGISTER LEVER ENGAGED IN FOURTH NOTCH COUNTERCLOCKWISE FROM BLANK PORTION OF REGISTER WHEEL
TM2246-186

Figure 445. Stop arm and register wheel alinement.

472. Type Wheel Transfer and Bell Crank Levers End Clearance Adjustments

(fig. 447)

a. Requirements.

(1) There should be a .040- to .050-inch clearance between the type wheel transfer lever and the upper bell crank assembly (A, fig. 447).

(2) There should be a .005- to .010-inch clearance between the type wheel lower bell crank assembly and the hub of the type wheel (B, fig. 447).

(3) There should be a .002- to .005-inch clearance between the upper shaft collar and the frame (B, fig. 447).

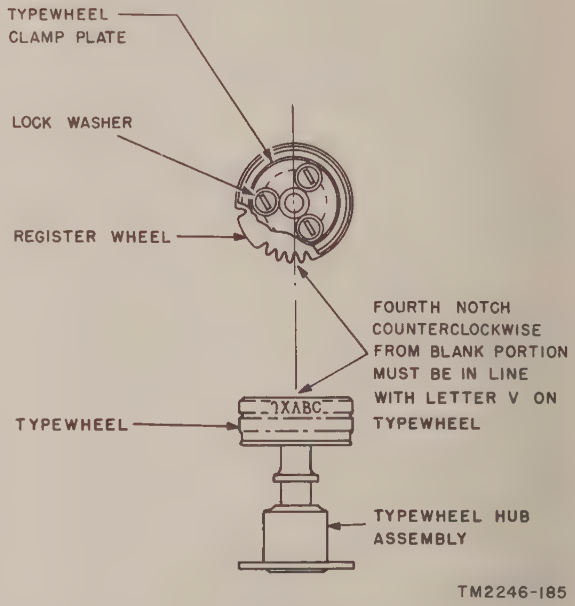

TYPEWHEEL CLAMP PLATE
LOCK WASHER
REGISTER WHEEL
FOURTH NOTCH COUNTERCLOCKWISE FROM BLANK PORTION MUST BE IN LINE WITH LETTER V ON TYPEWHEEL
TYPEWHEEL
XABC
TYPEWHEEL HUB ASSEMBLY
TM2246-185

Figure 446. Type wheel and register wheel alinement.

b. Adjustments.

(1) Loosen the screw in the upper bell crank assembly and position the assembly to give the required clearance; tighten the screw and recheck the clearance.

(2) Loose the screw in the lower bell crank assembly. Adjust for the required clearance between the lower bell crank assembly and the type wheel hub; tighten the screw and recheck the clearance.

(3) Loosen the set screw in the upper shaft collar and position the shaft collar to give the proper clearance, tighten the set screw and recheck the clearance.

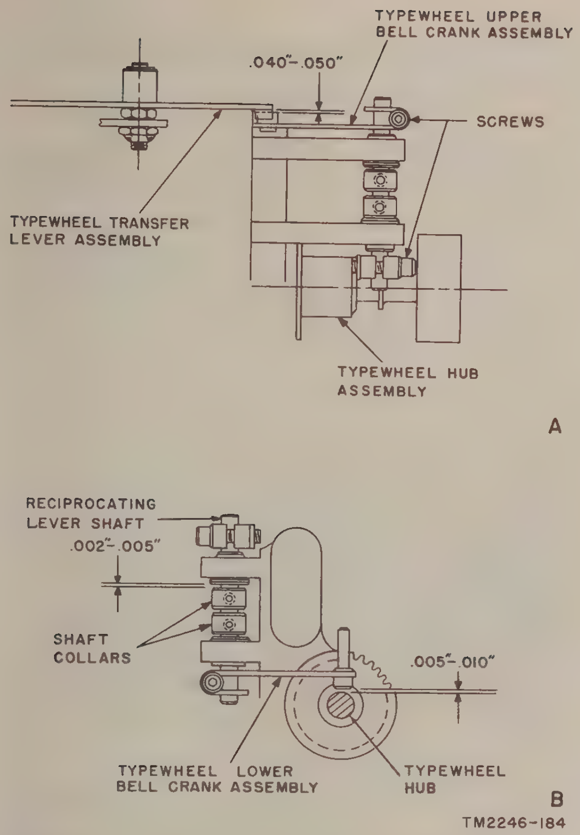

TYPEWHEEL UPPER BELL CRANK ASSEMBLY
.040"-.050"
SCREWS
TYPEWHEEL TRANSFER LEVER ASSEMBLY
TYPEWHEEL HUB ASSEMBLY
A
RECIPROCATING LEVER SHAFT
.002"-.005"
SHAFT COLLARS
.005"-.010"
TYPEWHEEL LOWER BELL CRANK ASSEMBLY
TYPEWHEEL HUB
B
TM2246-184

Figure 447. Type wheel and bell crank levers end clearance adjustments.

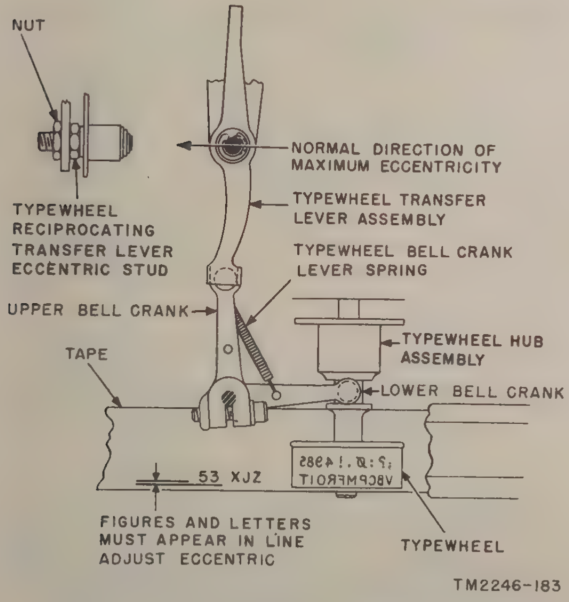

NUT
NORMAL DIRECTION OF MAXIMUM ECCENTRICITY
TYPEWHEEL RECIPROCATING TRANSFER LEVER ECCENTRIC STUD
TYPEWHEEL TRANSFER LEVER ASSEMBLY
TYPEWHEEL BELL CRANK LEVER SPRING
UPPER BELL CRANK
TYPEWHEEL HUB ASSEMBLY
TAPE
LOWER BELL CRANK
53 XJZ
FIGURES AND LETTERS MUST APPEAR IN LINE ADJUST ECCENTRIC
TYPEWHEEL
TM2246-183

Figure 448. Type wheel figures-letters alinement.

473. Type Wheel Figures-Letters Alinement

(fig. 448)

a. Requirement. The printing of figures and letters on the tape must appear in a straight line of print.

b. Adjustment. Loosen the nut on the type wheel reciprocating transfer lever eccentric stud of the transfer lever assembly and adjust the type wheel reciprocating transfer lever eccentric stud until the requirement is met; tighten the nut and recheck the requirements.

474. Print and Register Levers Shaft End Play Adjustment

(fig. 449)

a. Requirement. There should be .002- to .005-inch clearance between the retainer ring and the type wheel register lever.

b. Adjustment. Loosen the set screw in the front support frame. Insert a feeler gage between the retainer ring and the type wheel register lever. Move the print and register levers shaft toward the front support frame. Tighten the set screw.

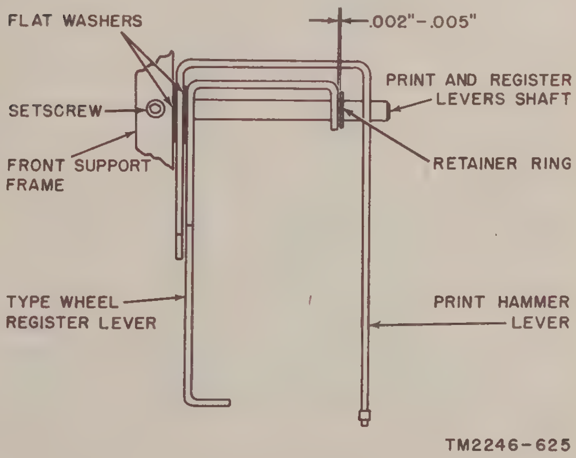


Figure 449. Print and register levers shaft end play adjustment.

475. Copy Alinement Adjustment

(fig. 450)

a. Requirement. The copy should be equally spaced between the first line of the punched code holes and the edge of the tape.

b. Adjustment. Loosen the screw in the type wheel lower bell crank assembly and adjust the type wheel hub assembly until the requirement is met; tighten the screw. After this adjustment,

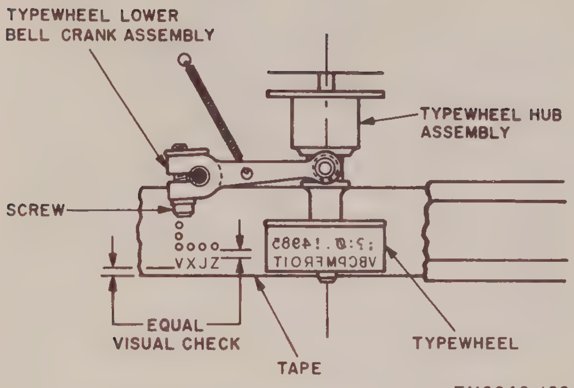


Figure 450. Copy alinement adjustment.

always recheck the feed hole spacing and detent eccentric stud alinement adjustment (par. 486).

476. Print Hammer Lever Alinement in Operated Position

(fig. 451)

a. Requirement. When the print hammer lever is in the printing (upper) position, there should be approximately .010-inch clearance between the print hammer lever and the type wheel.

b. Adjustment. Loosen the locking nut on the print hammer eccentric stop. Rotate the print cam to the position shown. Adjust the print hammer eccentric stop until the requirement is met. Tighten the locking nut and check the printed copy; if the printing is too light or too heavy, readjust the print hammer eccentric stop slightly. (Check related adjustment, paragraph 477.)

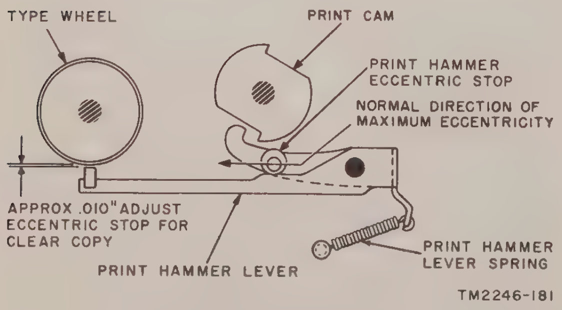

TYPE WHEEL
PRINT CAM
PRINT HAMMER ECCENTRIC STOP
NORMAL DIRECTION OF MAXIMUM ECCENTRICITY
APPROX .010" ADJUST ECCENTRIC STOP FOR CLEAR COPY
PRINT HAMMER LEVER
PRINT HAMMER LEVER SPRING
TM2246-181

Figure 451. Print hammer lever alinement in operated position.

477. Type Wheel Register Lever Alinement in Operated Position

(fig. 452)

a. Requirement. There should be a .005- to .015-inch clearance between the type wheel register lever and the eccentric stud.

b. Adjustment. Loosen the locknut and position the eccentric stud until the requirement is met; tighten the locknut and recheck the clearance. (Check related adjustment, paragraph 476.)

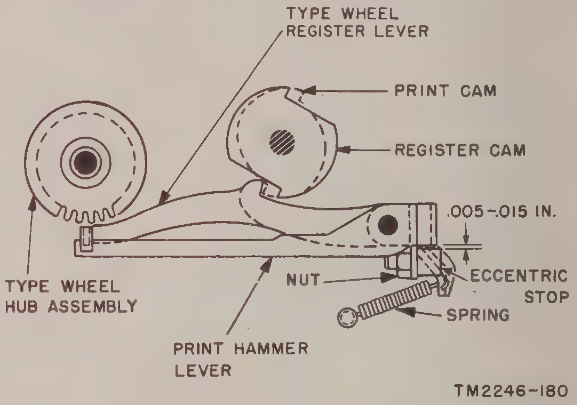


Figure 452. Type wheel register lever alinement in operated position.

478. Code Hole Punch Levers Clearance Adjustment

(fig. 453)

a. Requirement. There should be .001- to .003-inch clearance between the last flat washer in the pivot stud and the punch arm.

b. Adjustment. Loosen the nut and adjust the pivot stud for proper clearance; tighten the nut and recheck the requirement.

479. Code Punch Bars and Code Hole Punch Levers Alinement and Clearance Adjustment

(fig. 454)

a. Requirements.

(1) There should be a .001- to .006-inch clearance between each code punch lever and the flat surfaces of its associated code punch bar.

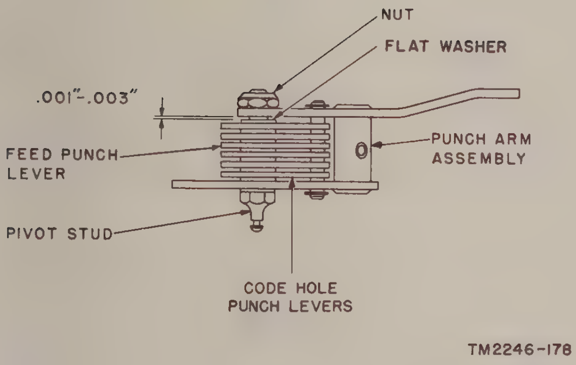


Figure 453. Code hole punch levers clearance adjustment.

(2) There should be a .001- to .003-inch clearance between the comb and the flat surface of each code punch bar.

b. Adjustments.

(1) Loosen the screws that hold the code die assembly to the front support frame. Insert or remove enough shims to meet the requirement in *a*(1) above; tighten the screws and recheck the clearance.

(2) Loosen the machine screws holding the comb to the code die support. Position the comb until requirement in *a*(2) above is met; tighten the machine screws and recheck the clearance.

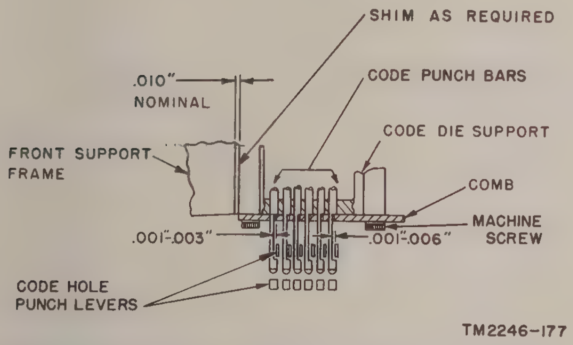


Figure 454. Code punch bars and code hole punch levers alinement and clearance adjustment.

480. Punch Interference and Code Hole Punch Levers Alinement Adjustment

(fig. 455)

a. Requirement. The code hole punch lever blocking arms of the interference levers should be alined for equal spacing as shown.

b. Adjustment. Loosen the set screw in the front support frame and position the interference levers to meet the requirement; tighten the set screw and recheck the requirement.

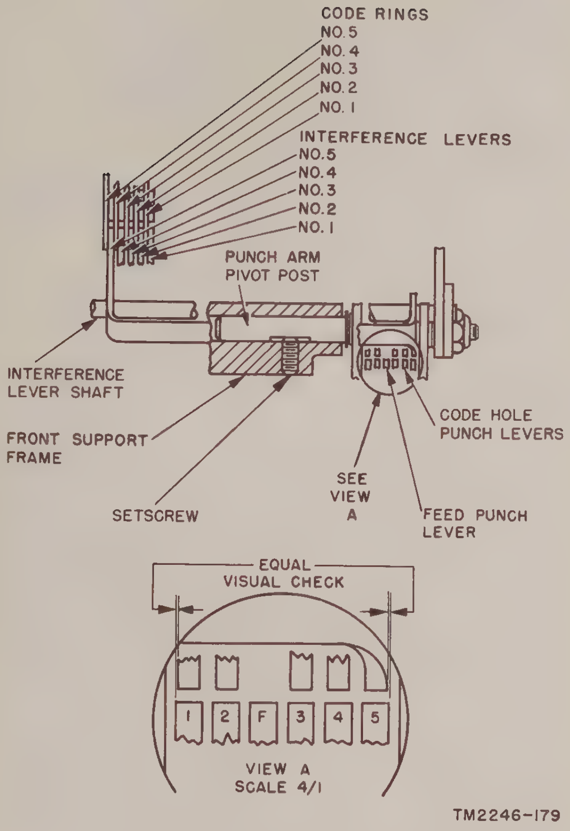


Figure 455. Punch interference and code hole punch levers alinement adjustment.

481. Code Hole Punch and Interference Levers Clearance Adjustment

(fig. 456)

a. Requirement. There should be .015- to .020-inch clearance between the code hole punch levers and interference levers when the interference levers are in the space position.

b. Adjustment. Loosen the nuts and position the adjusting plate until the requirement is met; tighten the nuts and recheck the clearance.

482. Code Hole Punch Levers and Cam Roller Clearance Adjustment

(fig. 457)

a. Requirement. There should be .005- to .010-inch clearance between the code hole punch levers and the lower edge of the notch in the code punch bars when the punch arm assembly is at its maximum counterclockwise position.

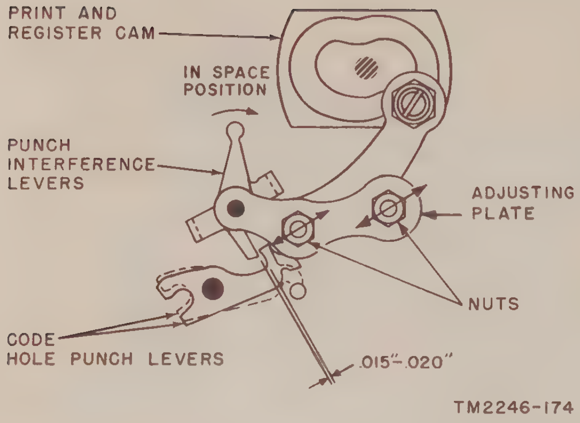


Figure 456. Punch and interference levers clearance adjustment.

b. Adjustment. Loosen the locknut and adjust the eccentric stud until the requirement is met. The eccentric stud is to be adjusted for minimum clearance between the cam roller and the print and register cam. Tighten the locknut and recheck the clearance.

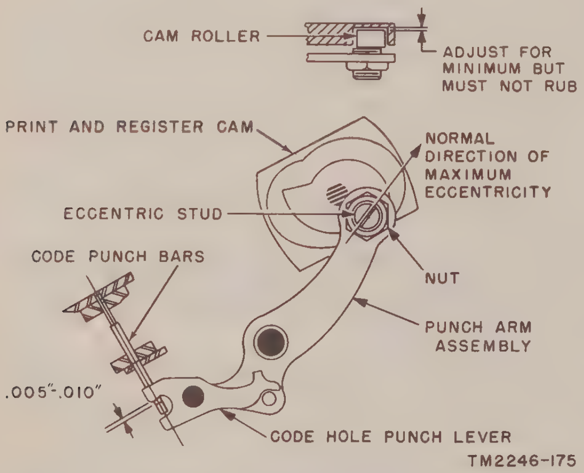


Figure 457. Code hole punch levers and cam roller clearance adjustment.

483. Tape Feed Detent Lever Alinement
(fig. 458)

a. Requirement. A pull of 9 to 15 ounces should be required to start the detent lever moving away from the detent wheel.

b. Method of Checking. With the eccentric stud adjusted for maximum eccentricity as shown, check the pull with a spring scale. If the pull is less than minimum, replace the spring. (Check related adjustment paragraph 486.)

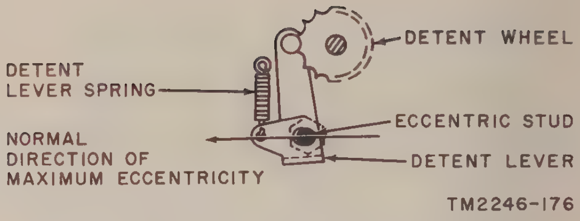


Figure 458. Tape feed detent lever alinement.

484. Feed Pawl Alinement
(fig. 459)

a. Requirement. There should be .010- to .025-inch clearance between the feed pawl and the ratchet wheel when the print and register cam is in the stop position.

b. Adjustment. Loosen the locknut on the feed pawl pivot and turn the feed pawl pivot until the requirement is met; tighten the locknut and recheck the clearance.

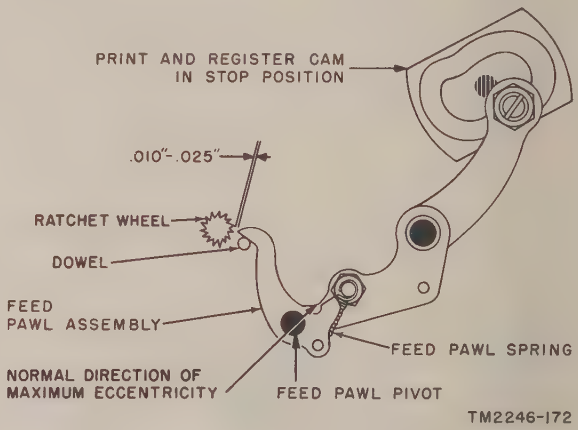


Figure 459. Feed pawl alinement.

485. Feed Pawl and Ratchet Wheel Clearance Adjustment
(fig. 460)

a. Requirement. The feed pawl should turn the ratchet one tooth for each operation.

b. Adjustment. Release the lever latch and turn the motor by hand until the feed pawl turns the ratchet wheel one tooth. Turn the machine screw in or out so the feed pawl will just clear the ratchet tooth when the motor is turned by hand to complete the cycle. Recheck this step to be sure that

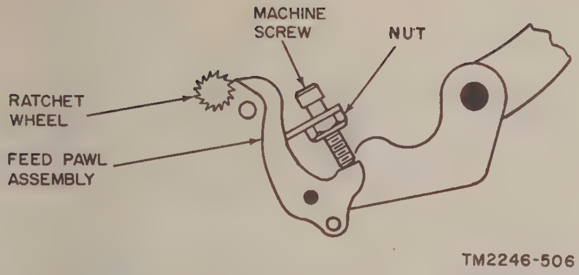


Figure 460. *Feed pawl and ratchet wheel clearance adjustment.*

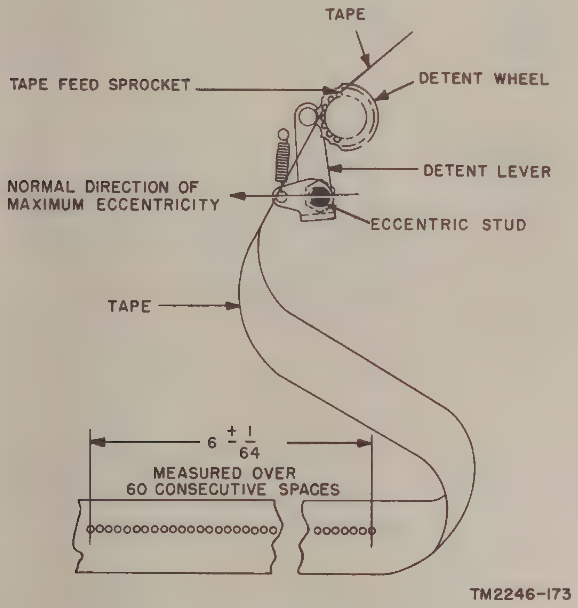


Figure 461. *Feed hole spacing and detent eccentric stud alinement.*

there is a complete feed of one tooth by the feed pawl.

486. Feed Hole Spacing and Detent Eccentric Stud Alinement

(fig. 461)

a. Requirement. Punched feed holes in the messages tape should be spaced evenly; 10 holes per inch.

b. Adjustment. Measure the distance between 60 consecutive holes. The distance should be 6 inches plus or minus 1/64 inch. If the requirement is not met, loosen eccentric stud locknut, turning eccentric stud clockwise to decrease spacing or counterclockwise to increase spacing until the requirement is met. Tighten the locknut and recheck the requirement. Repeat this procedure until the requirement is met.

487. Tape Feed Sprocket and Retaining Adjustment

(fig. 462)

a. Requirements.

(1) There should be minimum clearance between the stripper and the tape feed sprocket.

(2) There should be .001- to .003-inch clearance between the tape feed sprocket and the code die support.

(3) The detent wheel should be centered with the roller on the detent lever.

b. Adjustments.

(1) Loosen the two machine screws holding the stripper and move the stripper up or down until the tape feed sprocket will turn without rubbing against the stripper; tighten the machine screws.

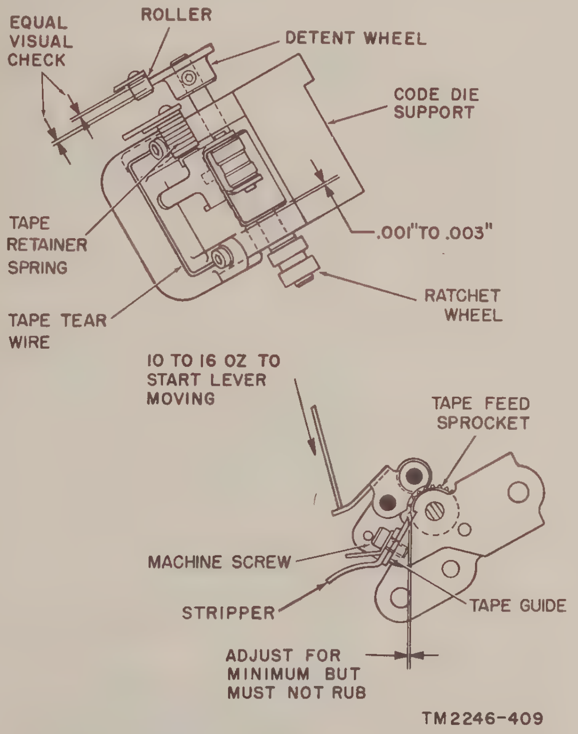


Figure 462. *Tape feed sprocket and retaining adjustment.*

(2) Loosen the two setscrews in the tape feed sprocket. Push the ratchet wheel against the code die support and move the tape feed sprocket axially on the ratchet wheel shaft to obtain the required clearance; tighten the two setscrews.

(3) Loosen the setscrew on the detent wheel and move the detent wheel to center it with the roller on the detent lever; tighten the setscrew.

488. Back Space Mechanism Alinement
(fig. 463)

a. Requirement. With a full depression of the back space lever, the tape should back space one character.

b. Adjustment. Loosen the pawl eccentric screw locknut and rotate the pawl eccentric screw to meet the requirement. If the requirement cannot be obtained by rotating the pawl eccentric screw, bring into close adjustment and bend the pawl tab with a long-nose pliers.

489. Ratchet Feed Detent Adjustment
(fig. 464)

a. Requirement. There should be a minimum over-travel of .010-inch of the ribbon feeding detent wheel when the ribbon feed cam follower is on the high part of the cam.

b. Adjustment. Loosen the setscrew holding the eccentric stud and turn the eccentric stud

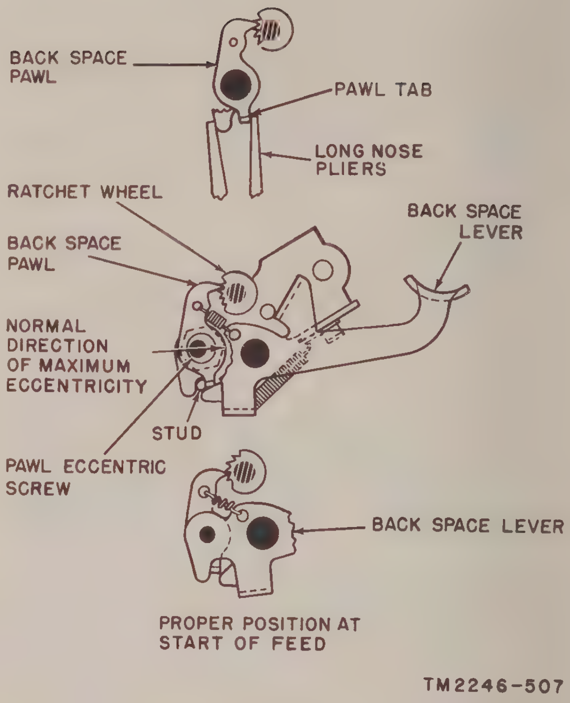


Figure 463. Back space mechanism alinement.

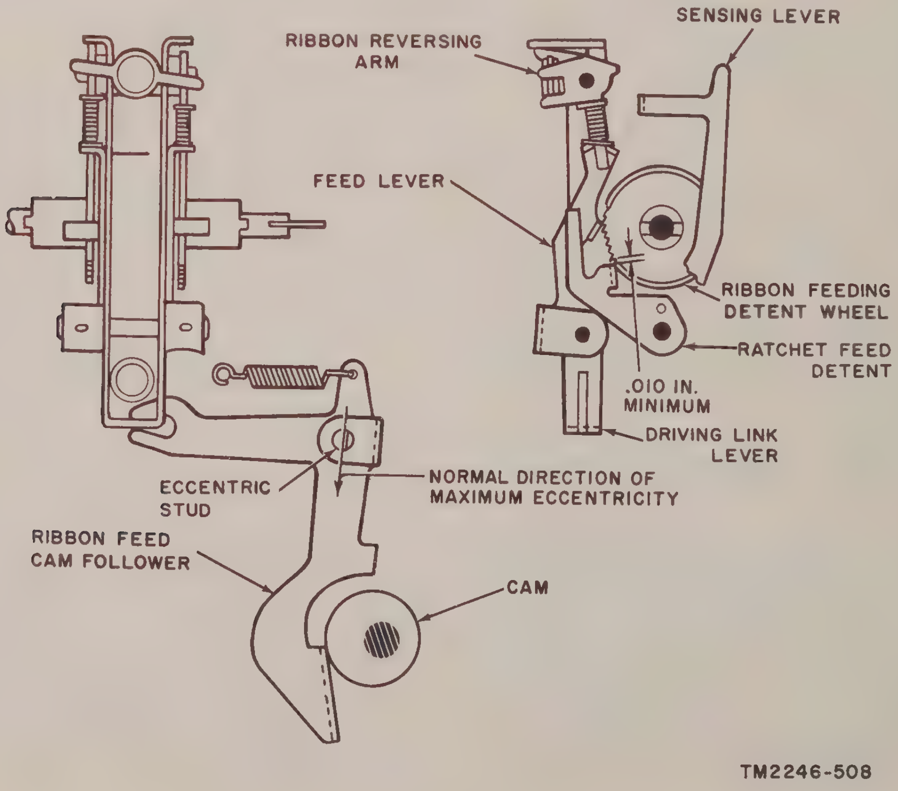


Figure 464. Ratchet feed detent adjustment

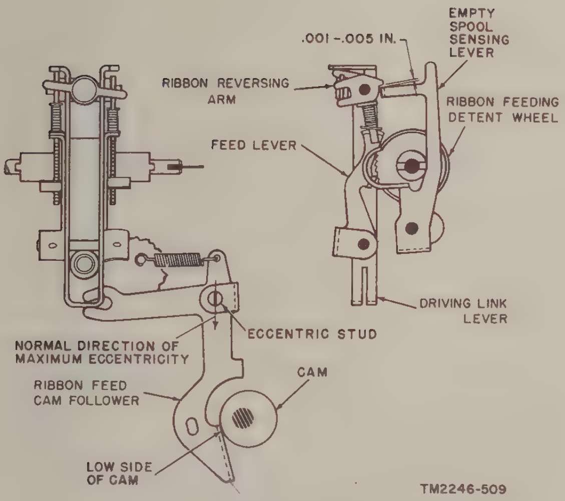


Figure 465. Sensing lever adjustment.

counterclockwise to meet the requirement; tighten the setscrew.

Note. The sensing levers should be held out of engagement with the ribbon reversing arm. A rubber band can be used.

490. Sensing Lever Adjustment

(fig. 465)

a. Requirement. When the cam follower is against the low side of the cam, there should be not more than .005-inch clearance between the ribbon reversing arm and the empty spool sensing lever.

b. Adjustment. Bend the ear on the empty sensing lever to meet the requirement.

Note. The ear should engage the ribbon reversing arm approximately 50 percent of the thickness of the empty spool sensing lever.

491. Ribbon Feed Lever Adjustment

(fig. 466)

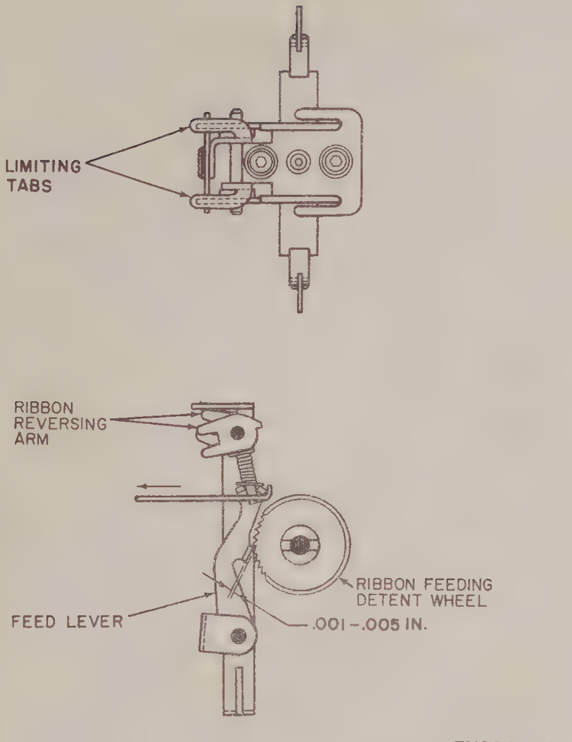
a. Requirement. The feed lever should engage the ribbon feeding detent wheel with not more than .005-inch clearance between the feed lever and the bottom of the tooth in the ribbon feeding detent wheel.

b. Adjustment. If the feed lever does not meet the requirement, carefully bend the toggle limiting tabs.

492. Simultaneous Transfer Lever Spring Adjustment

(fig. 467)

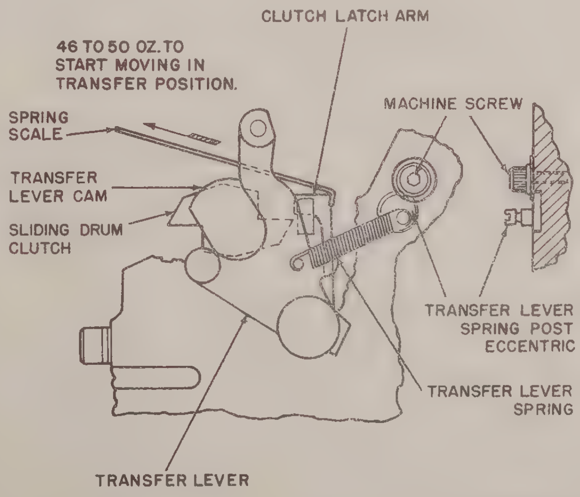
a. Requirement. It should require 46 to 50 ounces to start the clutch latch arm moving when the transfer lever is in the transferred position.



TM2246-510

Figure 466. Ribbon feed lever adjustment.

b. Adjustment. Loosen the machine screw and turn the transfer lever spring post eccentric to meet the requirement; tighten the machine screw.



TM2246-511

Figure 467. Simultaneous transfer lever spring adjustment.

493. Sequential Transfer Lever Spring Adjustment

(fig. 468)

a. Requirement. It should require 34 to 38 ounces to start the clutch latch arm moving when the transfer lever is in the transferred position.

b. Adjustment. Loosen the machine screw and turn the transfer lever spring stop eccentric to meet the requirement; tighten the machine screw.

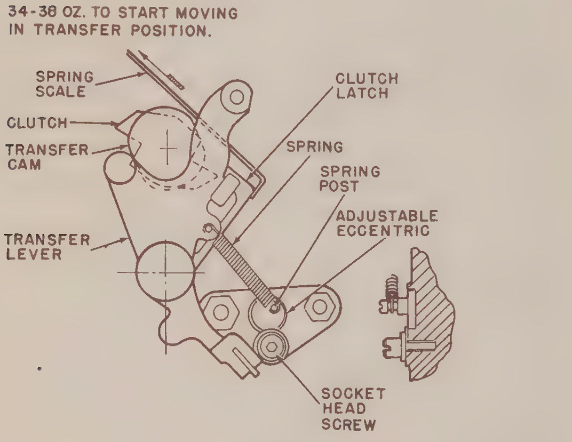


Figure 468. Sequential transfer lever spring adjustment.

494. Switch Operating Lever Adjustment

(fig. 469)

a. Requirement. There should be a minimum of .010-inch clearance between the switch operating lever and the manual tape feed-out switch when the limit stop lever is in contact with the right side of the hole in the front support plate.

b. Method of Checking. The manual tape feed-out switch should be closed.

c. Adjustment. Loosen the machine screw and set the gap with a feeler gage. Turn the limit stop lever until it is in contact with the right side of the hole in the front support plate; tighten the machine screw.

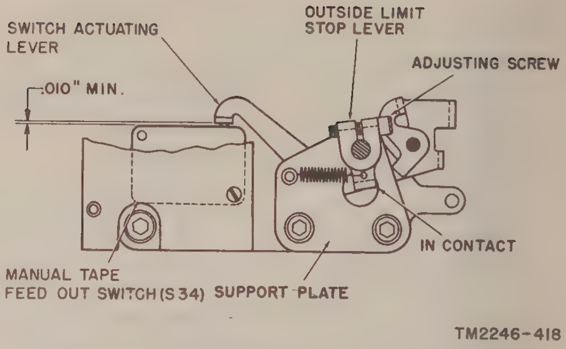


Figure 469. Switch operating lever adjustment.

495. Kickout Pawl Adjustment

(fig. 470)

a. Requirement. When the switch operating lever is in the closed position and the stop plate is just ready to be disengaged from the kickout pawl, there should be 1/64- to 3/64-inch clearance between the kickout pawl and the clamp.

b. Adjustment. Loosen the clamping screw and the screw in the spacing stud. Loosen the spacing stud and place the switch operating lever in closed position. Then turn the motor by hand until the stop plate is in its final contact position, the position of the stop plate just before it loses contact with the kickout pawl. Move the rear support plate until a gap of 1/64- to 3/64-inch is set between the inside clamp and the kickout pawl. Tighten the spacing stud, the clamping screw, and the spacing stud screw.

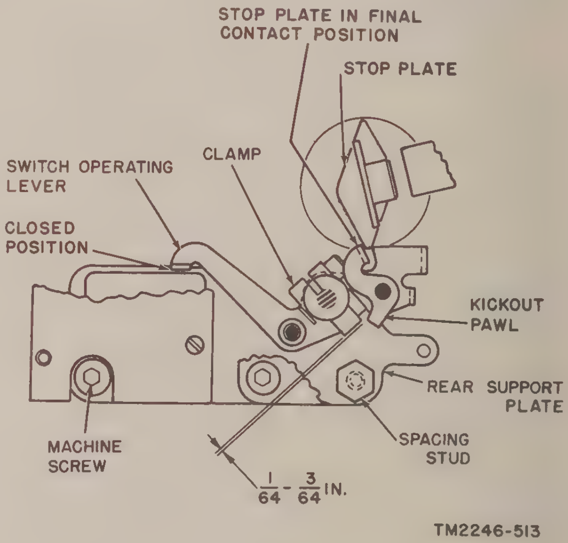


Figure 470. Kickout pawl adjustment.

496. Manual Tape Feed-Out Link Adjustment

(fig. 471)

a. Requirement.

(1) There should be a maximum of .010-inch clearance between the connector and the E-ring on the stud.

(2) The Y-levers should be completely in the space position and the manual tape feed-

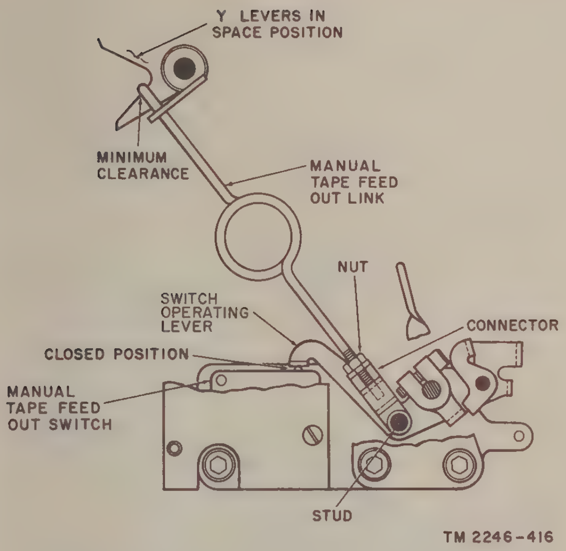


Figure 471. Manual tape feed-out link adjustment.

out link slightly extended before the manual tape feed-out switch is operated.

(3) All Y-levers should be engaged simultaneously by the manual tape feed-out link.

b. Adjustment

(1) Add washer or washers and peel as required.

(2) Remove the connector from the stud and back off the nut. Set the Y-levers in the space position and then move the switch operating lever until the manual tape feed-out switch operates. Turn the connector until it can be placed on the stud with just a slight pressure exerted by the manual tape feed-out link holding the Y-levers in the space position. Tighten the nut against the connector and replace the E-ring on the stud.

(3) Bend the hooked end of the manual tape feed-out link to engage all the Y-levers simultaneously. Recheck requirement in *a*(1) above.

497. Manual Tape Feed-Out Lever Adjustment

(fig. 472)

a. Requirement. There should be approximately the same amount of travel of the manual tape feed-out lever from the vertical to the open position of the switch operating lever as there is from the vertical to the closed position.

b. Adjustment. Loosen the machine screw on the manual tape feed-out lever. Position the manual tape feed-out lever approximately at an intermediate position between the open and closed position of the switch operating lever and tighten the machine screw.

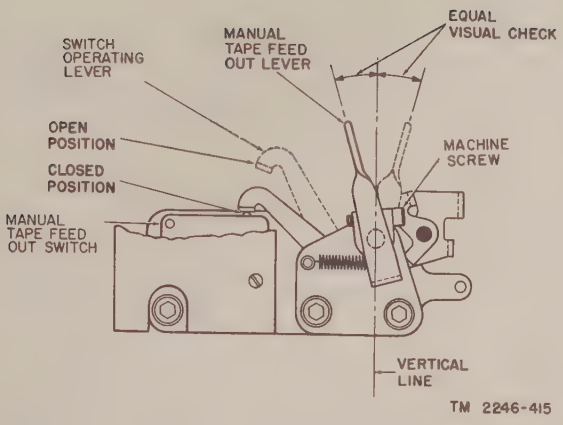


Figure 472. Manual tape feed-out lever adjustment.

498. Alarm Lever Adjustment

(fig. 473)

a. Requirement. The buzzer should sound when the alarm lever is moved to within ¼- to ⅜-inch of the supply reel hub.

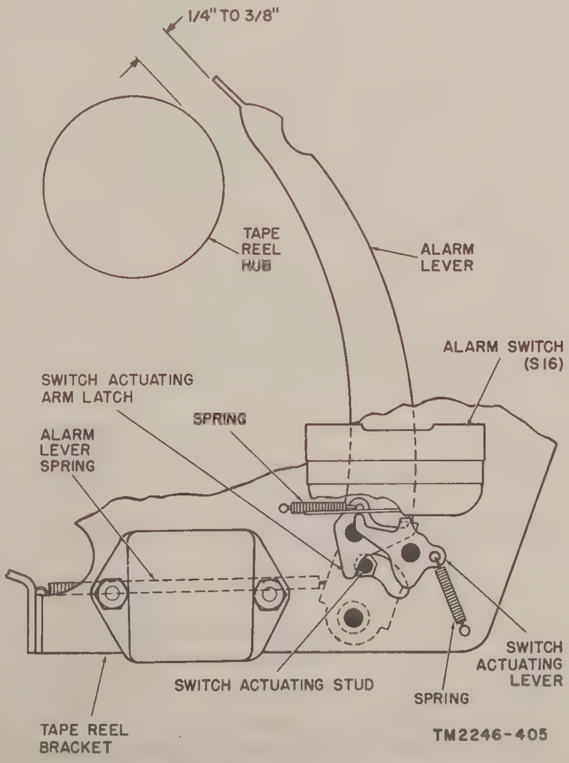


Figure 473. Alarm lever adjustment.

b. Adjustment. Loosen the nut on the switch actuating stud. Adjust the switch actuating stud to trip the switch actuating arm latch when the alarm lever is in the position shown above; tighten the nut.

499. Tape Guide Locating Adjustment

(fig. 474)

a. Requirements. The tape guide should just touch the tape reel bracket as shown and the tape guide should be horizontal with the perforator base.

b. Adjustment. Loosen the tape guide machine screws and position the tape guide to meet the requirement.

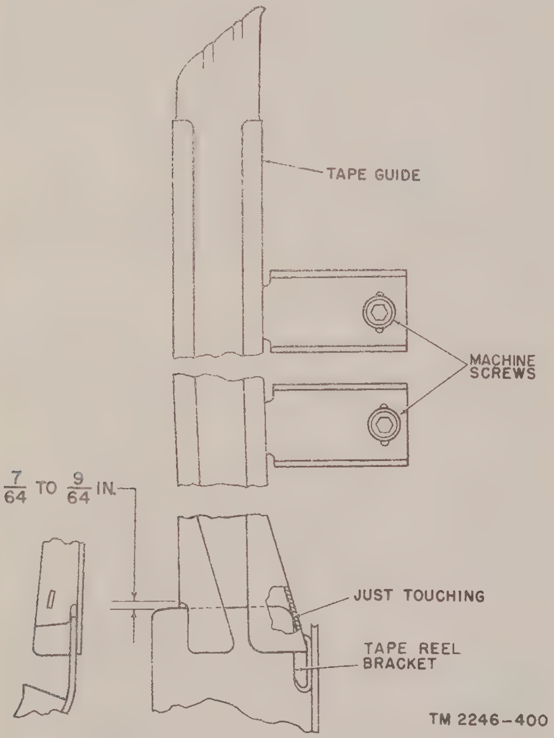


Figure 474. Tape guide locating adjustments.

500. Perforator Latch Pulsing Cam Adjustment

(fig. 475)

a. Requirements.

(1) With the machine in the stop position, the notch on the perforator latch pulsing cam should be aligned with the end of the cam follower (A, fig. 476).

(2) There should be an additional clearance of .005- to .008-inch between the cam follower stop and the cam follower after contacts have just touched, and then the perforator latch pulsing cam rotated so the cam follower is on the high part of the perforator latch pulsing cam (B, fig. 476).

b. Adjustments.

(1) Loosen the setscrew in the perforator latch pulsing cam and rotate the perforator latch pulsing cam until the notch is alined with the end of the cam follower; tighten the setscrew.

(2) Rotate the perforator latch pulsing cam until the cam follower is on the high part of the perforator latch pulsing cam. Loosen the two machine screws and move the perforator latch pulsing contact (S20) until contacts just touch. Check the clearance between the cam follower stop and the cam follower. To this clearance add .005- to .008-inch. Move the perforator latch pulsing contacts (S20) toward the perforator latch pulsing cam until the clearance plus the .005- to .008-inch is between the cam follower stop and the cam follower; tighten the machine screws. Check the requirement in *a*(1) above to make sure the cam follower is still alined with the notch on the perforator latch pulsing cam.

501. Receiving Multisolenoid Pulsing Cam Adjustment

(fig. 476)

a. Requirements.

(1) With the machine in the normal stop position, the setscrew of the receiving multisolenoid pulsing cam should be alined with the mating end of the cam follower. In the normal stop position the contact closest to the cam should be open .020- to .030-inch while the contact away from the cam should be open .010- to .015-inch.

(2) There should be an additional clearance of .005- to .008-inch between the cam follower stop and the cam follower after contacts just touched, and then the receiving multisolenoid pulsing cam rotated so the cam follower is on the high part of the receiving multisolenoid pulsing cam (B, fig. 476).

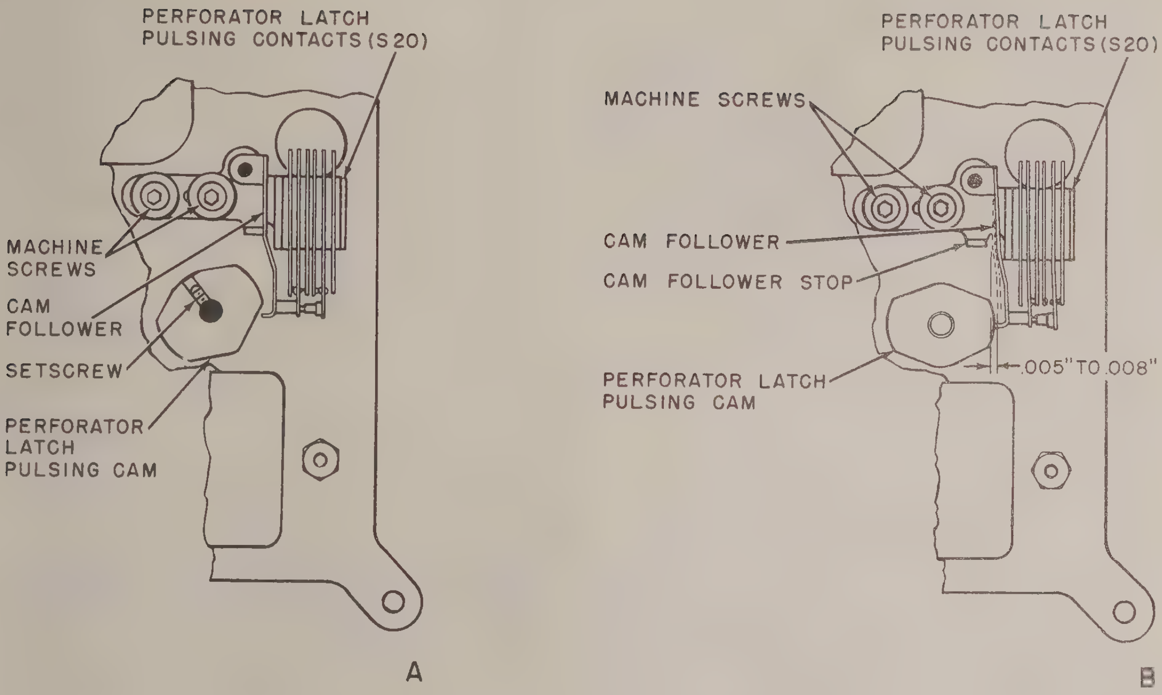

PERFORATOR LATCH PULSING CONTACTS (S20)
MACHINE SCREWS
CAM FOLLOWER
SETSCREW
PERFORATOR LATCH PULSING CAM
A
PERFORATOR LATCH PULSING CONTACTS (S20)
MACHINE SCREWS
CAM FOLLOWER
CAM FOLLOWER STOP
PERFORATOR LATCH PULSING CAM
.005" TO .008"
B
TM2246-514

Figure 475. Perforator latch pulsing cam adjustment.

b. Adjustment.

(1) Loosen the setscrew in the receiving multisolenoid cam. Rotate the receiving multisolenoid cam to meet the requirement; tighten the setscrew. Bend the contacts to meet the requirement or replace with a new receiving multisolenoid pulsing contacts.

(2) Rotate the receiving multisolenoid cam until the cam follower is on the high part of the receiving multisolenoid cam. Loosen the two machine screws and move the receiving multisolenoid pulsing contacts (S18) until the contacts just touch. Check the clearance between the cam follower stop and the cam follower, and to this clearance add .005- to .008-inch. Move the receiving multisolenoid pulsing contacts (S18) toward the receiving multisolenoid pulsing cam until the clearance plus the .005- to .008-inch is between the cam follower stop and the cam follower. Tighten the machine screws. Check the requirement in *a*(1) above to see if the cam follower is still alined with the notch in the receiving multisolenoid pulsing cam.

502. Dust Cover Knob and Copy Light Screws Adjustments

The chart below gives the references for the individual adjustments which are identical to the adjustments for the page printer.

Adjustment	Par. ref	Fig. ref
Dust cover knob adjustment	417	403
Dust cover copy light screws adjustment	415	401

503. Dust Cover Grounding Jack Adjustment

(fig. 477)

a. Requirement. The grounding jack should be even with or just above the bottom line of the dust cover.

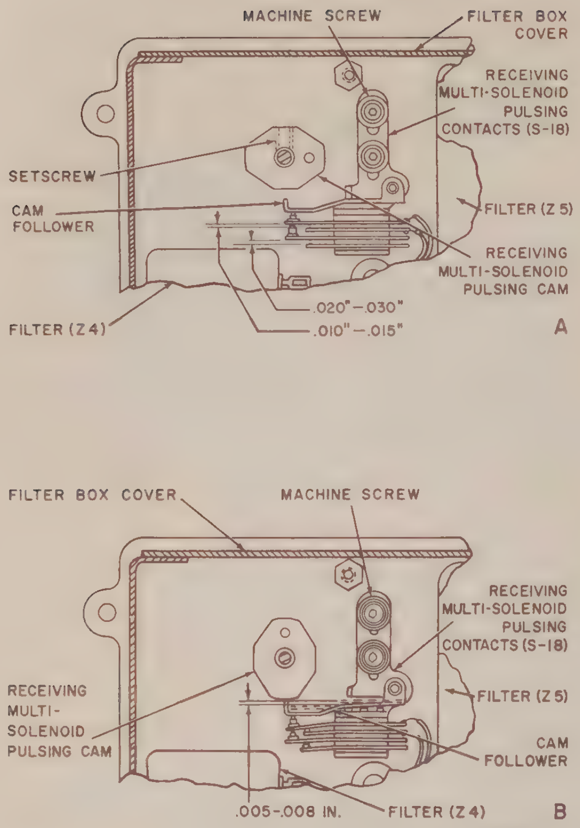
b. Adjustment. Loosen the binding head screw and slide the grounding jack to meet the requirement; tighten the binding head screw.

504. Dust Cover Latch Adjustment

(fig. 478)

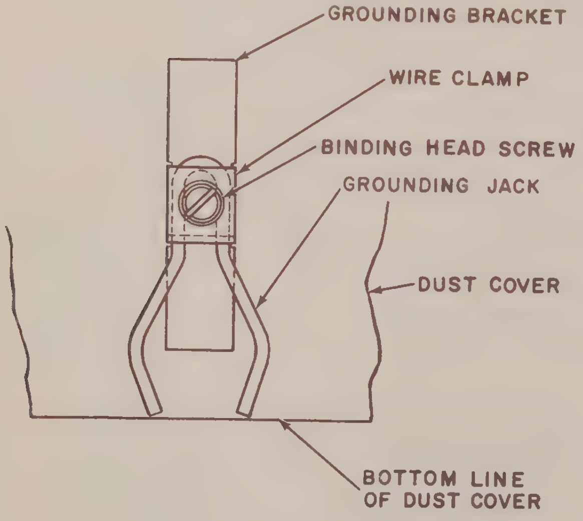
a. Requirement. The dust cover front door should close smoothly and be tight when closed.

b. Adjustment. Loosen the binding head screws and move the latch plate until it just touches the



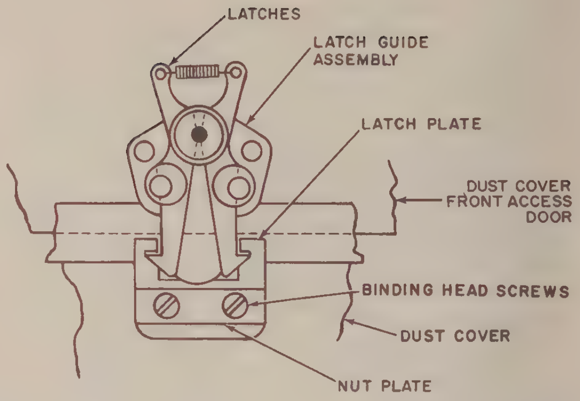
TM2246-515

Figure 476. Receiving multisolenoid pulsing cam adjustment.



TM2246-516

Figure 477. Dust cover ground jack adjustment.



TM2246-517

Figure 478. Dust cover latch adjustment.

contacting surfaces of the two latches evenly. Tighten the binding head screws. Operate the dust cover door a few times to see if it meets the requirement; readjust if necessary.

505. Dust Cover Tape Guide Adjustment

(fig. 479)

a. Requirement. There should be $\frac{1}{64}$ to $\frac{1}{32}$-inch clearance between the edge of the tape coming from the reperforator and the ear on the guide.

b. Adjustment. Loosen the binding head screws and slide the guide bracket to meet the requirement; tighten the binding head screws.

506. Tape Passage Adjustment

(fig. 480)

a. Requirement. The tape should pass smoothly into and through the punch and feed mechanism.

b. Adjustment. Bend the end of the tape down before inserting into the tape guide.

507. Transfer Contact Bail End Play Adjustment

(fig. 481)

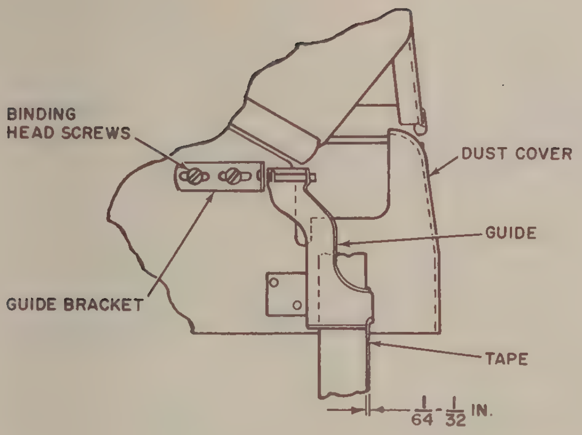
a. Requirement. There should be .002- to .005-inch clearance between the E ring on the post and the transmitter contact bail.

b. Adjustment. Loosen the socket set screw and move the post axially to meet the requirement; tighten the socket set screw.

508. Selector Lever End Play Adjustment

(fig. 482)

a. Requirement. There should be .002- to .005-inch clearance between the spacer and the first selector lever.



TM2246-518

Figure 479. Dust cover tape guide adjustment.

b. Adjustment. Loosen the setscrew and slide the stud in or out to meet the requirement. Tighten the setscrew.

509. Selector Lever Engagement

(fig. 483)

a. Requirement. There should be a minimum of .005-inch clearance between the latching surface of each code sensing lever and the latching surface of its mating selector lever.

b. Adjustment. Loosen the two screws that mount the selector lever comb and position the selector lever comb until the requirement is met. Check the clearance at each of the five selector levers and readjust if necessary.

510. Clutch Magnet Armature Eccentric Stud Adjustment

(fig. 484)

a. Requirement.

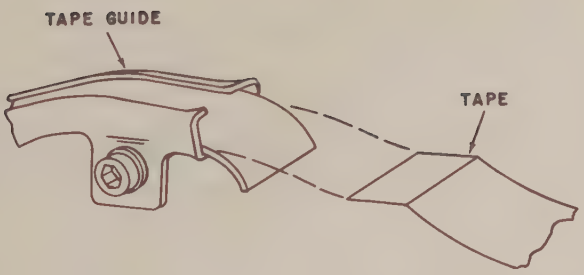
(1) There should be .002- to .004-inch clearance between the top of the stop lever and the clutch magnet armature when the clutch magnet armature is in its operated position.

(2) There should be .010- to .025-inch clearance between the locking edges of the levers.

b. Adjustment.

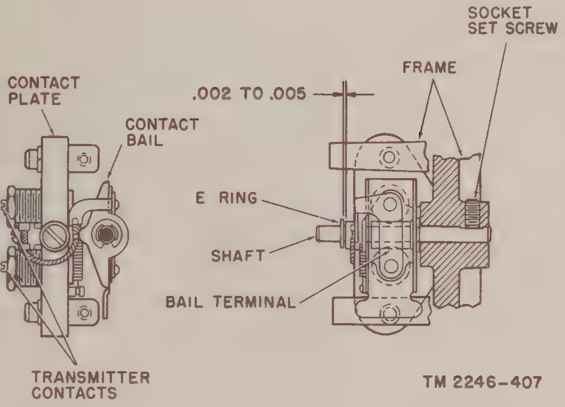
(1) Loosen the setscrew in the casting above the eccentric stud and position the eccentric stud until the requirement is met.

(2) Position the selector lever comb to meet the requirement.



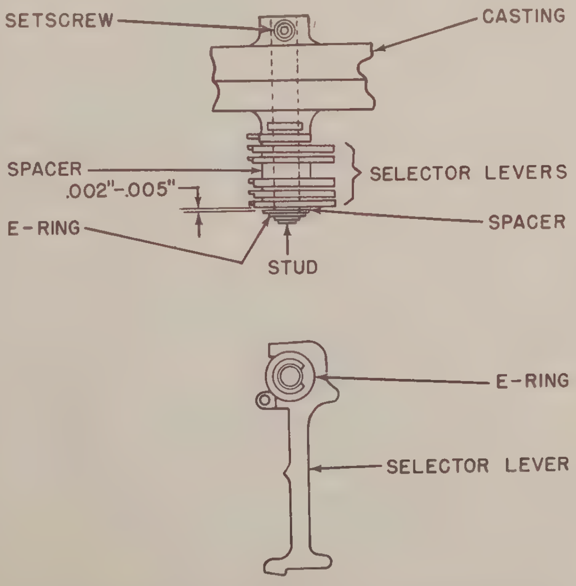
TM 2246-401

Figure 480. Tape passage adjustment.



TM 2246-407

Figure 481. Transmitter contact bail end play adjustment.



TM2246-622

Figure 482. Selector lever end play adjustment.

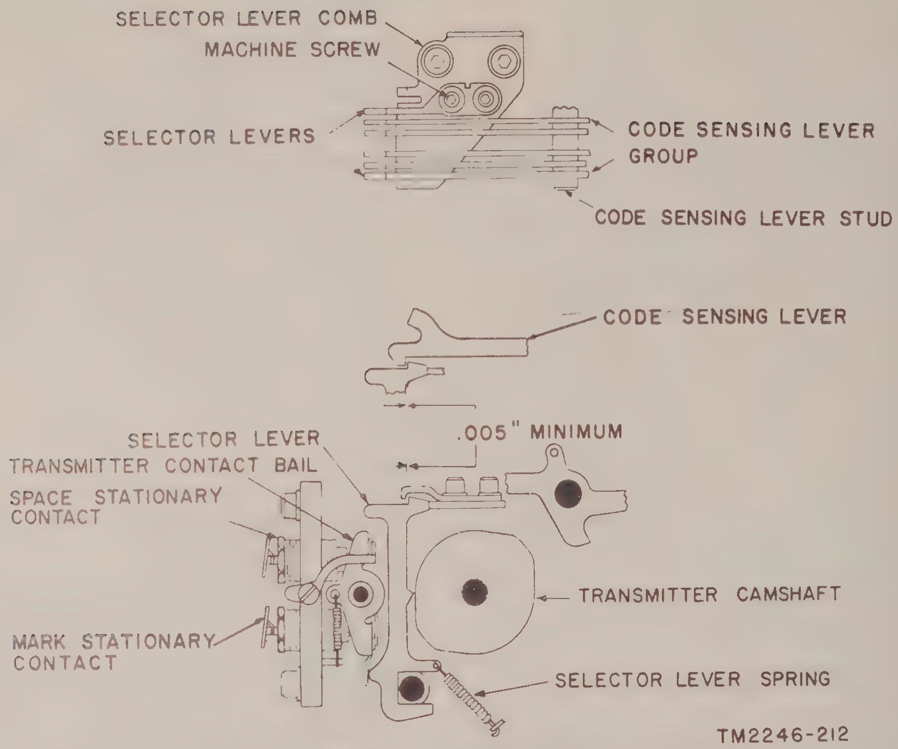


Figure 483. Selector lever engagement and stop selector lever latch adjusiment.

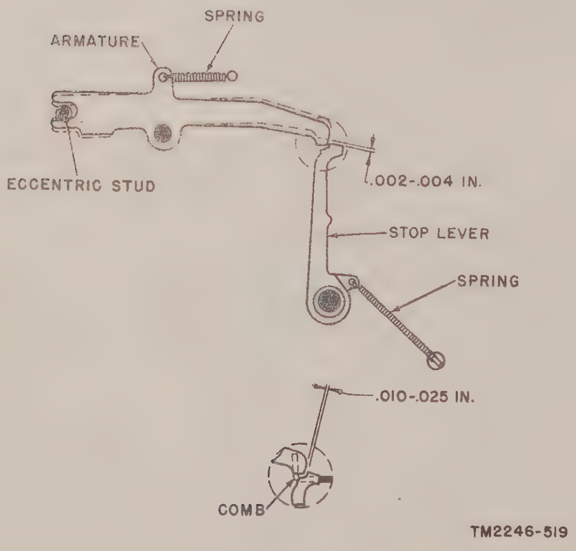


Figure 484. Clutch magnet armature eccentric stud adjustment.

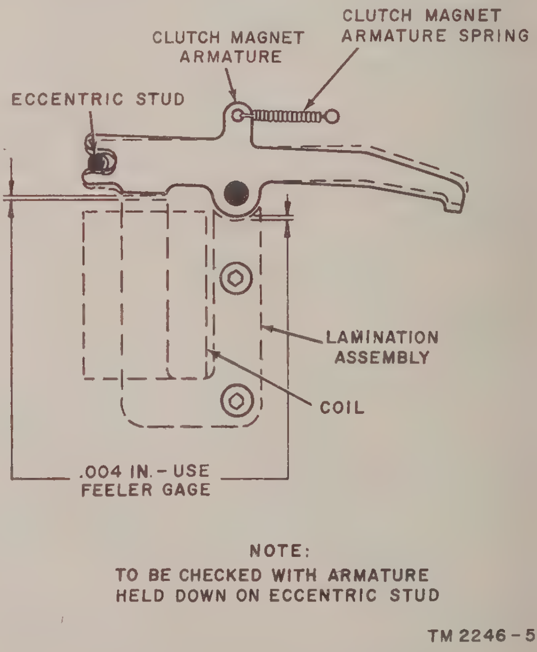

CLUTCH MAGNET ARMATURE SPRING
CLUTCH MAGNET ARMATURE
ECCENTRIC STUD
LAMINATION ASSEMBLY
COIL
.004 IN.- USE FEELER GAGE
NOTE:
TO BE CHECKED WITH ARMATURE HELD DOWN ON ECCENTRIC STUD
TM 2246-520

Figure 485. Clutch magnet adjustment.

511. Clutch Magnet Adjustment

(fig. 485)

a. Requirement. There should be .003- to .004-inch clearance between the laminated clutch magnet cores and the clutch magnet armature when the clutch magnet armature is in its operated position.

b. Adjustment. Loosen the two screws mounting the clutch magnet and position the cores to meet the requirement; tighten the screws. Use perforator tape as feeler gage.

512. Stop Selector Lever Latch Adjustment

(fig. 483)

a. Requirement. Breaks should not occur in the send circuit between successive marking impulses.

b. Method of Checking. With the power connected to the tap transmitter and a voltmeter set for at least 115 volts dc connected across the mark and common contact, slowly rotate the motor by hand. Watch the voltmeter; any indication of voltage will show breaks between marking impulses.

c. Adjustment. With the voltmeter connected as described in *b* above, and a tape perforated with the letters code group inserted in the transmitter-distributor, back off the marking stationary contact until breaks in the send circuit are indicated on the meter. Screw the contact a short distance toward the transmitter contact bail. Rotate the motor by hand and watch the meter for breaks in the circuit. Repeat this procedure until all breaks between successive marking impulses are eliminated.

513. Tape Guide Adjustment

(fig. 486)

a. Requirement. There should be .002- to .005-inch clearance between the tape guide and the tape cover.

b. Adjustment. Back the setscrews away from the guide retaining screws. Adjust the tape guide retaining screws to meet the requirement when the tape guide is held against the heads of the tape guide retaining screw; tighten the setscrews against the tape guide retaining screws.

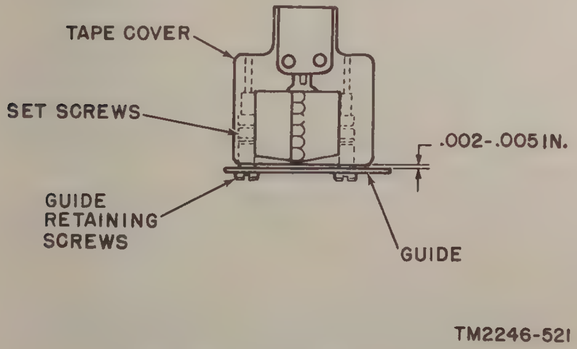


Figure 486. Tape guide adjustment.

514. Tape Cover Clearance Adjustment

(fig. 487)

a. Requirement. There should be .002- to .005-inch clearance between the tape cover and the top cover when the tape cover is pushed to the right against the shoulder of the hinge pin.

b. Adjustment. Loosen the screw and insert a feeler gage between the tape cover and the top cover. Use a screwdriver to turn the hinge pin until the shoulder is tight against the tape cover; tighten the screw and remove the feeler gage.

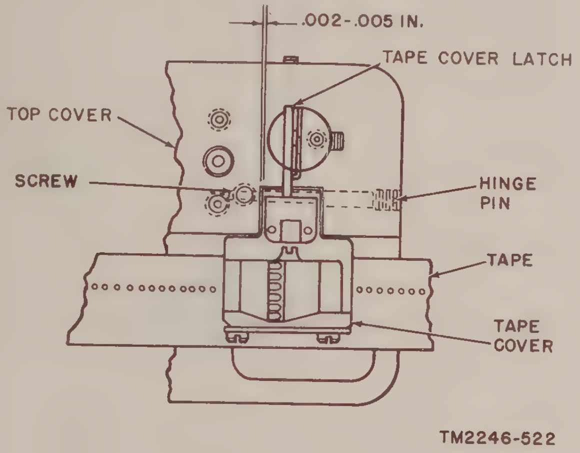


Figure 487. Tape cover clearance adjustment.

515. Top Cover Alinement

(fig. 488)

a. Requirement. There should be equal clearance between the edges of a piece of ⅞-inch tape and the tape guide in the top cover when the feed pins are fully in the tape feed holes.

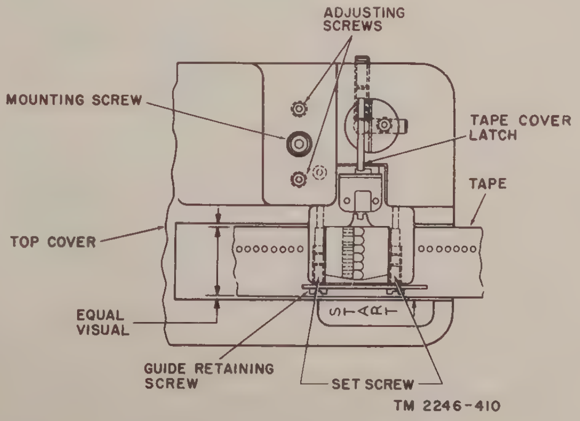


Figure 488. Top cover alinement.

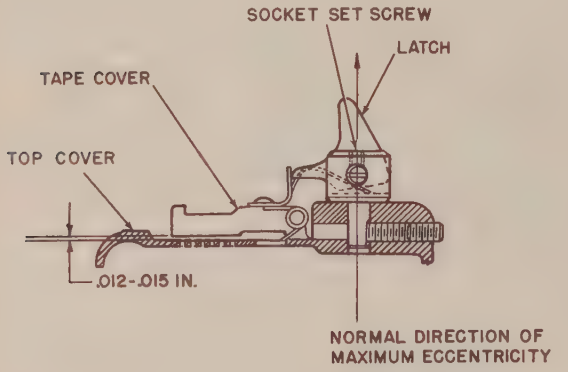
b. Adjustment. Move the start-stop lever to start position. Loosen the three mounting screws and reposition the top cover until the requirement is met; tighten the three mouning screws.

516. Tape Cover Latch Adjustment

(fig. 489)

a. Requirement. There should be .012- to .015-inch clearance between the bottom of the tape cover and the surface of the top cover when the tape cover is latched.

b. Adjustment. Loosen the socket setscrew and turn the tape cover latch eccentric to meet the requirement; tighten the socket setscrew.



TM2246-523

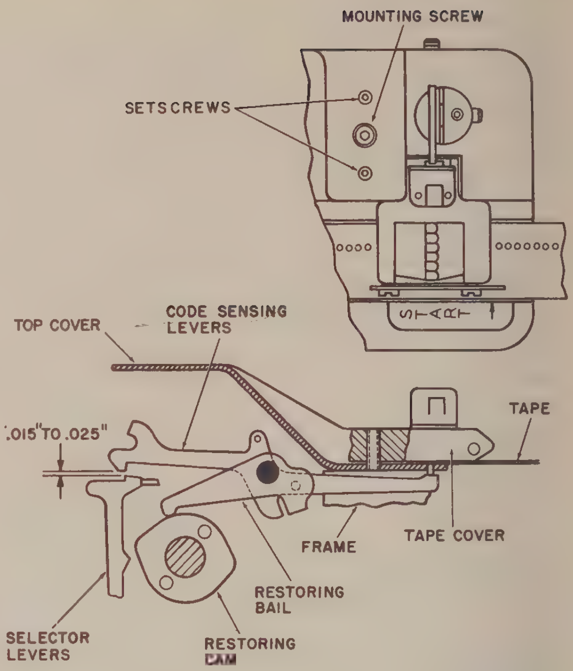
Figure 489. Tape cover latch adjustment.

517. Selector Lever and Code Sensing Lever Clearance Adjustment

(fig. 490)

a. Requirement. There should be .015- to .025-inch clearance between the selector levers and the code sensing levers when the restoring bail is on the low portion of the restoring cam and the code sensing levers are held downward in the space position by the tape.

b. Adjustment. With the top cover held in place with only the two rear mounting screws, place a piece of tape perforated with the blank combination in the tape guide slot in the top cover. Move the start-stop lever to the start position. Rotate the restoring cam until the restoring bail is on the low portion of the restoring cam; turn the two adjusting screws in the top cover up or down to meet the requirement. Replace and tighten the front mounting screw and recheck the clearance. Turn the adjusting screws clockwise to decrease the clearance and counterclockwise to increase the clearance.



TM2246-411

Figure 490. Selector lever and code sensing lever clearance adjustment.

518. Tape-out Lever Spring Adjustment

(fig. 491)

a. Requirement. With the tight tape lever held in the up position, it should require a force of 84 to 98 grams to move the tape-out lever below the tape chute.

b. Adjustment. Wind the torsion spring about the tape-out lever pivot to meet the requirement.

519. Upper Switch Bail Adjustment

(fig. 492)

a. Requirement.

(1) With the start-stop lever detent and the start-stop lever in the position shown, there should be a clearance of .005 to .025 inch between the tape-out lever and the upper switch bail.

(2) The start-stop switch should be actuated in the center of the stop-start positions of the START-STOP lever.

b. Adjustment.

(1) Obtain required clearance by bending the upper switch bail.

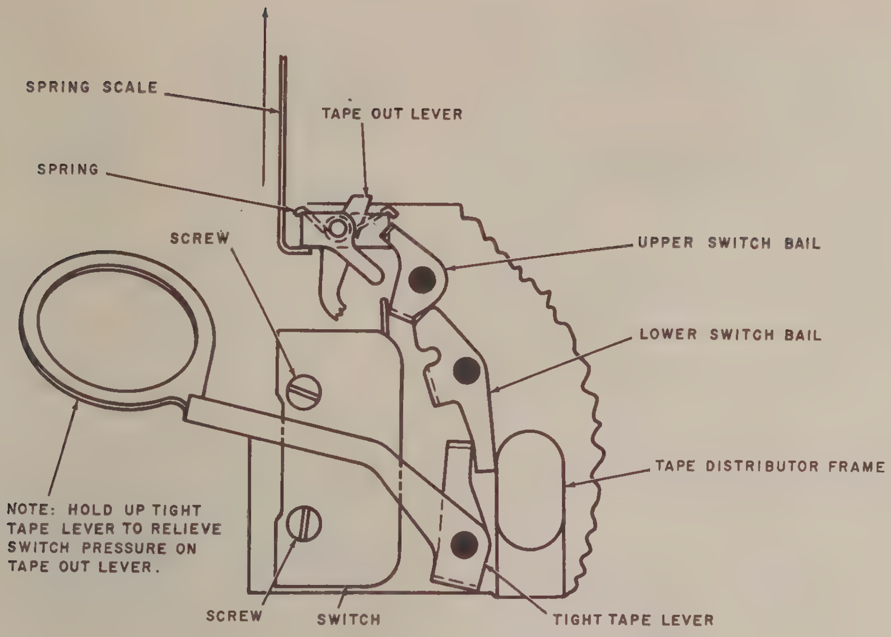


Figure 491. Tape-out lever spring adjustment.

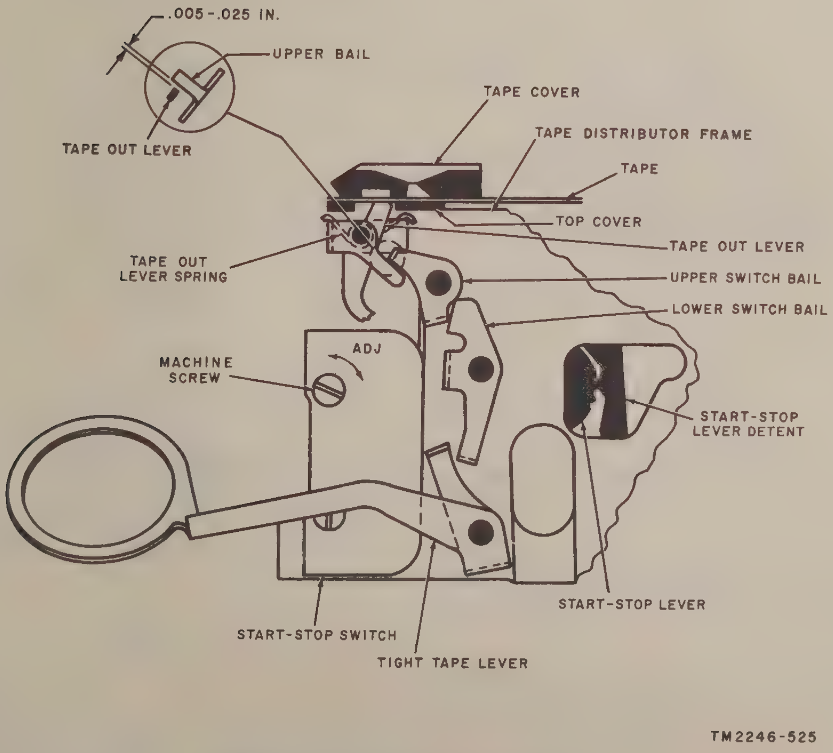


Figure 492. Upper switch bail adjustment.

(2) Loosen the two start-stop switch machine screws and position the start-stop switch to meet the requirement; tighten the machine screws.

520. Transmitter-distributor Friction Clutch Adjustment

(fig. 493)

a. Requirement. It should require a pull of 35 to 40 ounces to prevent the transmitter-distributor friction clutch from turning when the motor is on.

b. Method of Checking. Install a piece of punched tape in the transmitter-distributor. Hook a spring scale on the clutch fork. Move the transmitter-distributor control lever to the start position and, while holding the scale rigidly, read the scale.

c. Adjustment. Loosen the clamping screw on the clutch collar and turn the collar until the clutch spring exerts moderate pressure on the clutch disk. Tighten the clamping screw on the collar and check the requirement. Readjust until the proper setting is attained.

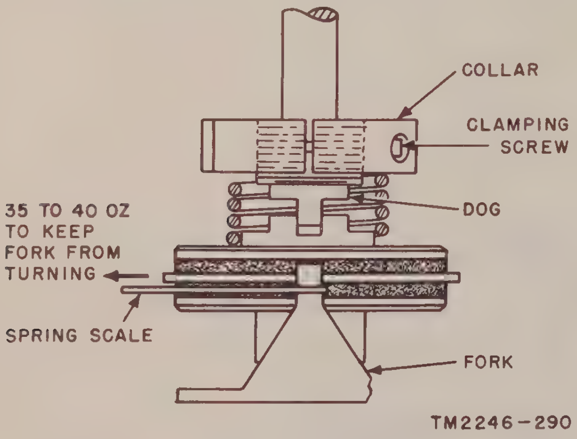


Figure 493. Transmitter-distributor friction clutch adjustment.

521. Motor Governor Contacts Alinement

(fig. 494)

a. Requirement.

(1) The contacts should be visually centered and adjusted for maximum area of engagement.

(2) A maximum force of 8 ounces should be required to turn the gear assembly at any point within the operating range of the motor.

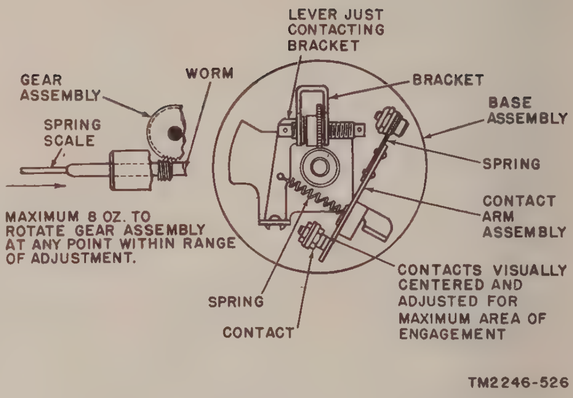

LEVER JUST CONTACTING BRACKET
GEAR ASSEMBLY
WORM
BRACKET
BASE ASSEMBLY
SPRING SCALE
SPRING
CONTACT ARM ASSEMBLY
MAXIMUM 8 OZ. TO ROTATE GEAR ASSEMBLY AT ANY POINT WITHIN RANGE OF ADJUSTMENT.
CONTACTS VISUALLY CENTERED AND ADJUSTED FOR MAXIMUM AREA OF ENGAGEMENT
SPRING
CONTACT
TM2246-526

Figure 494. Motor governor contacts alinement.

b. Adjustment.

(1) Loosen the contact arm spring mounting screw and position the contact arm assembly to meet the requirement.

(2) Check for dirt or bind between the worm and the gear assembly.

522. Tape Storage Guide Adjustment

(fig. 495)

a. Requirement. The tape entering the tape storage guide should be centered in the opening of the tape storage guide.

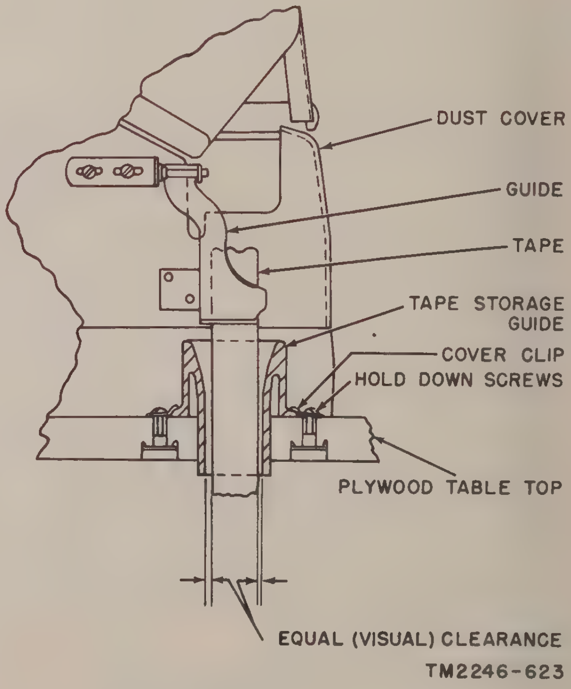


Figure 495. Tape storage guide adjustment.

b. Adjustment. Loosen the four hold down screws and move the tape storage guide to meet the requirement. Tighten the hold down screws.

523. Tape Puller Bracket Adjustment

(fig. 496)

a. Requirement. The tape puller arm roller should have some clearance but not more than .010-inch between the edge of the tape puller arm roller and the bottom of the punch cam.

b. Adjustment. Loosen the two machine screws and position the tape puller bracket to meet the requirement. Tighten the machine screws.

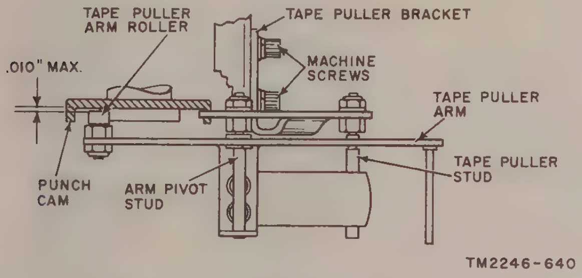


Figure 496. Tape puller bracket adjustment.

524. Tape Puller Arm Adjustment

(fig. 497)

a. Requirement. When the punch cam follower is on a high part of the punch cam, the tape puller arm roller should be on the opposite high part of the punch cam.

b. Adjustment. Loosen the nut holding the arm pivot stud. Release the transfer latch and turn the motor by hand until the punch cam follower is on the high part of the punch cam. Move the arm pivot stud to meet the requirement. Tighten the nut.

525. Tape Puller Stud Adjustment

(fig. 497)

a. Requirement. There should be .008- to .020-inch clearance between the tape puller stud and the tape puller spring when the feed pawl has just cleared the feed rachet and the feed operation is completed.

b. Adjustment. Loosen the tape puller stud nut. Release the transfer latch and turn the motor by hand slowly until the feed pawl has just cleared the feed ratchet and the feed operation is completed. Position the tape puller stud to meet the requirement. Tighten the tape puller stud nut.

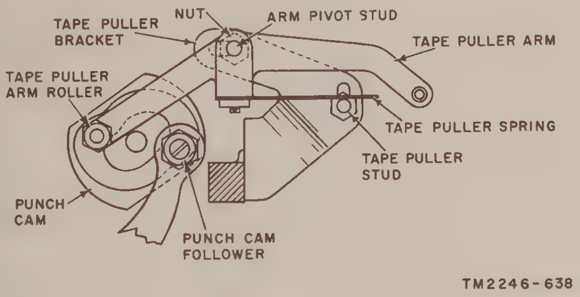


Figure 497. Tape puller arm adjustment.

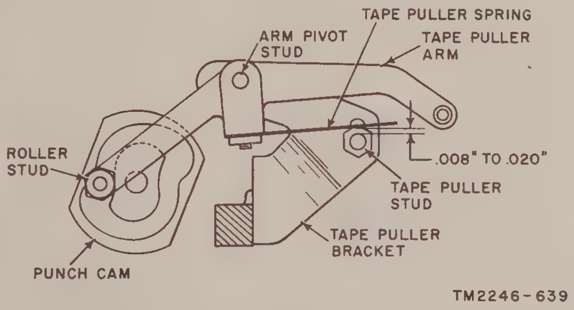


Figure 498. Tape puller stud adjustment.

Section IX. SPRING DATA

526. Crossed-End Spring Data

(fig. 499)

		A	B		C	D	E
Reference No.	Name	Free length (in.)	Extended length (in.)	Required tension, extended strength	Wire thickness (in.)	Number of coils	Diameter (in.)
50196	Trip pawl	9/16	⅝	1 oz ± ¼ oz	0. 010 ± . 0003	30	0. 125 OD
50333	Line feed pawl	⅝	¾	2½ oz ± ½ oz	. 010 ± . 0003	40	. 125 OD
50904	Transfer lever latch	11/16	13/16	2½ oz ± ¾ oz	. 012 ± . 0003	31	. 156 OD
50906	Carrier-return bell crank	11/16	13/16	4½ lbs ± 6 oz	. 034 ± . 0005	8½	. 250 OD
50911	Carriage feed clutch lever	25/32	15/16	40 oz ± 4 oz	. 025 ± . 0005	15	. 200 OD
50912	Paper roller latch	½	21/32	17½ oz ± ½ oz	. 018 ± . 0005	12¾	. 156 OD
50915	Function cam follower support lever.	21/32	23/32	4 lbs 2 oz ± 6 oz	. 038 ± . 0008	7¼	. 250 OD
50916	Delaying latch	⅜	½	7 oz ± 1 oz	. 013 ± . 0003	12¼	. 125 OD
50919	Function blocking bar	½	⅝	2½ oz ± ¼ oz	. 011 ± . 0003	26	. 125 OD
50941	Key lever	½	⅝	20 oz ± 2 oz	. 020 ± . 0003	8¾	. 187 OD
50946	Double blocking lever	19/32	11/16	28 oz ± 3 oz	. 024 ± . 0003	11¾	3/16 OD
51136	Universal code bar return	11/16	1	15 to 20 grams	. 009 ± . 0003	45 max	. 150 OD
51544	Locking lever latch	⅞	1⅛	1½ oz ± ¼ oz	. 010 ± . 0003	57	. 125 OD
51754	Line feed sensing lever	11/16	⅞	34 oz ± 4 oz	. 019 ± . 0008	26	⅛ OD
51755	Adjustable bell crank	15/16	1 5/16	28 oz ± 2½ oz	. 022 ± . 0003	28	. 187 OD
51851	Platen spacing detent	21/32	25/32	54 oz ± 6 oz	. 026 ± . 0005	16	. 160 OD
52161	Type wheel bell crank lever	1 3/32	1⅜	4½–5 oz	. 016 ± . 0003	45	. 187 OD
52167	Type wheel reciprocating lever	23/32	13/16	30–36 oz	. 030 ± . 0005	9¼	. 250 OD
52169	Letters sensing lever	13/16	1	33–36 oz	. 022 ± . 0003	25	. 141 OD
52171	Figures sensing lever	15/16	1 3/16	26–30 oz	. 020 ± . 0003	33	. 141 OD
52172	Shift cam follower	1 5/32	1 5/16	38–42 oz	. 026 ± . 0003	33	. 162 OD
52173	Bell sensing lever	13/16	1	24–28 oz	. 020 ± . 0003	28	. 141 OD
52602	Ribbon feed cam follower	13/36	1	32–35 oz	. 025 ± . 0003	19	. 197 OD
52604	Ribbon feed detent lever	11/16	⅞	1¼–1½ oz	. 009 ± . 0003	48¾	. 125 OD
53149	Platen lever latch	25/32	⅞	19–21 oz	. 020 ± . 0003	27	. 156 OD
53152	Code sensing lever	33/64	45/64	12 oz ± 1 oz	. 012 ± . 0003	29	. 085 OD
53153	Tape feed claw	½	21/32	2¾–3¼ oz	. 012 ± . 0003	23	. 125 OD
53154	Tape feed retracting lever	15/32	¾	11–13 oz	. 014 ± . 0003	11	. 156 OD
53155	Clutch magnet armature	17/32	25/32	4–6 oz	. 012 ± . 0003	22¼	. 125 OD
53313	Ratchet wheel detent	11/32	½	2½–3 oz	. 010 ± . 0003	10	. 125 OD
53569	Code-ring locking bail cam follower.	15/16	1 11/16	11 oz ± 1oz	. 018 ± . 0003	32	. 191 OD
53974	Space bar	15/32	⅝	86 oz ± 8 oz	. 028 ± . 0005	4¾	. 218 OD
55009	Y-lever detent	¼	. 342	90–130 grams	. 009 ± . 0003	12¾	. 083 OD
55014	Dust cover arm	1 1/16	1⅝	5 lbs 10 oz ± 10 oz	. 028 ± . 0005	27½	. 187 OD
55135	Paper guide	⅞	1 1/32	3 oz. ± ½ oz	. 012	31½	. 156 OD
55641	Wiper	5/16	⅜	40–65 grans	. 008 ± . 0003	14¼	. 084 OD
55941	Tab crank arm	9/32	11/32	4¾ oz ± ¼ oz	. 010	5¾	. 125 OD
55959	Cam follower	13/32	½	6⅔ oz ± ½ oz	. 013	11	. 125 OD
56258	Blocking lever	9/16	¾	6–8 oz	. 014 ± . 0003	17¾	. 140 OD
56586	Disabling latch	½	19/32	2 oz ± ¼ oz	. 010	22¾	⅛ OD
56591	Feed-out lever	½	⅝	6 oz ± 1 oz	. 015	14¾	5/32 OD
56594	Manual tape feed-out lever	⅝	¾	40 oz–4 oz	. 023	12¾	5/32 OD

527. Parallel-end Spring Data
(fig. 500)

Reference No.	Name	A Free length (in.)	B Extended length (in.)	Required tension, extended strength	C Wire thickness (in.)	D Number of coils	E Diameter (in.)
50231	Margin bell clapper	11/16	3/4	8 oz ±1 oz	0. 016±. 0003	28	0. 125 OD
50232	Margin bell trip pawl	5/8	11/16	1 oz ±1/4 oz	. 010±. 0003	36	. 125 OD
50334	Governor adjusting	15/16	1	32 oz ±3 oz	. 026±. 0005	26	. 156 OD
50403	Reversing detent	1	1 1/4	5 oz ±3/4 oz	. 013±. 0003	58	. 125 OD
50447	Ribbon sensing lever	13/32	15/32	2 oz ±1/2 oz	. 010±. 0003	11	. 156 OD
50595	Connecting bar	9/16	7/8	3 1/2 oz ±1/4 oz	. 011±. 0003	31	. 138 OD
50901	Line feed and figures shift cam follower.	9/16	7/8	8 oz ±1/2 oz	. 012±. 0003	33	. 095 OD
50903	Transfer lever	1 3/32	1 1/4	5 lbs 13 oz ±3 oz	. 042±. 0005	14	. 281 OD
50920	Signal bell clapper	23/32	27/32	1 1/2 oz ±1/4 oz	. 010±. 0003	45	. 125 OD
50921	Print cam follower	7/8	1 1/16	6 1/2 lbs ±8 oz	. 039±. 0005	11 3/4	. 250 OD
50943	Tabulator bar	7/8	1 1/16	2 1/4 oz ±1/8 oz	. 015±. 0003	40	5/32 OD
50944	Blocking lever	15/32	9/16	2 1/2 oz ±1/2 oz	. 010±. 0003	20	. 125 OD
51548	Contact bail	7/16	9/16	11 oz ±1 oz	. 015±. 0003	16	1/8 OD
51574	Sensing lever locking bail	5/8	27/32	2 1/2 oz ±1/4 oz	. 012±. 0003	28	. 156 OD
51575	Cam stop lever	13/16	1 3/16	3 oz ±1/2 oz	. 012±. 0003	40	. 156 OD
51645	Platen shift bell crank	1 1/4	1 1/2	8 oz ±1 oz	. 016±. 0003	57	. 156 OD
52163	Print hammer lever	7/8	1 1/16	18–22 oz	. 025±. 0003	16 1/2	. 250 OD
52164	Tape feed pawl	19/32	3/4	9 1/2–10 1/2 oz	. 016±. 0003	19	. 156 OD
52166	Detent lever	7/16	1/2	25 oz ±2 oz	. 020±. 0003	10 1/4	. 156 OD
52168	Figures-letters lever	1 7/32	1 7/16	3 1/4–3 3/4 oz	. 012±. 0003	74	. 125 OD
52192	Back space pawl	9/32	11/32	5 1/2 oz ±1 oz	. 011±. 0003	5	. 125 OD
52193	Back space lever	15/32	9/16	9–11 oz	. 016±. 0003	11 1/4	. 156 OD
52266	Supply reel tension	5/8	13/16	11–13 oz	. 018±. 0003	25	. 187 OD
52576	Alarm lever	3 7/8	4 3/16	18–22 oz	. 025±. 0003	139	. 197 OD
52603	Ribbon retainer lever	5/8	1	2 1/4–2 3/4 oz	. 012±. 0003	27	. 165 OD
53148	Dust cover latch	9/16	5/8	12–14 oz	. 022±. 0003	11 3/4	. 187 OD
54948	Blank holder	7/16	5/8	2 lbs ±4 oz			. 172 OD
55143	Stripper	19/32	11/16	42 grams, ±4 grams	. 009±. 0003		. 120 OD
55678	Code actuated switch cam follower.	1 3/64	1 3/16	64 oz ±6 oz	. 035±. 0005	17	. 250 OD
55679	Register lever	3/4	13/16	32 oz ±3 oz	. 025±. 0005	14	. 187 OD
55840	Link arm	3/4	1 1/8	4 oz ±1/2 oz	. 012	40	. 125 OD
55877	Switch actuator	2 1/8	3 5/16	1 1/4 oz ±1/4 oz	. 008	150	. 125 OD
56079	Lever latch	15/16	1 3/16	16 oz ±1 1/2 oz	. 020±. 0003	26	. 187 OD
56158	Register lever	3/4	1 1/16	11 oz ±1 oz	. 020±. 0003	14 1/2	. 250 OD
56159	Paper guide lever	1/2	5/8	35 grams ±5 grams	. 010±. 0003	25	. 125 OD

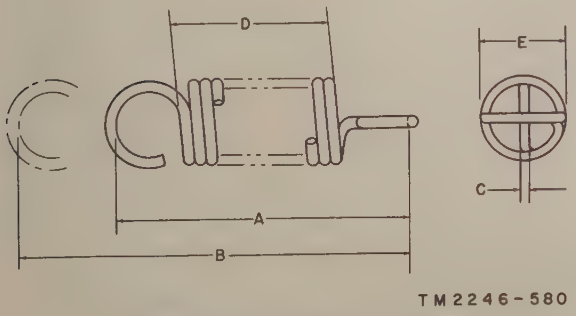


Figure 499. Crossed-end spring.

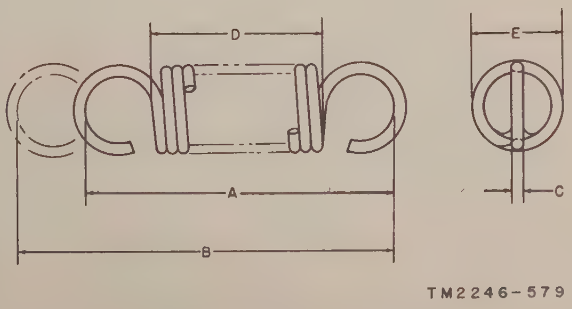


Figure 500. Parallel-end spring.

528. Extension Spring Data

(fig. 501)

Reference No.	Name	A Free length (in.)	B Compressed length (in.)	Required tension, compressed length	C Wire thickness (in.)	Number of coils	D Diameter (in.)
50416	Ribbon drive rack gear	1 7/32 ± 1/32	3/8	1½ oz ± ½ oz	0. 015 ± . 0003	7½ ± ¼	7/32 ID
50848	Clutch	¾ ± 1/16	7/16	1 lb 12 oz ± 3 oz	. 041 ± . 0005	5½	. 578 ID
50917	Function selecting arm	9/16 ± 3/64	13/32	6 oz ± ½ oz	. 024 ± . 0003	5 ± ¼	. 390 ID
51593	Contact plunger	5/8 ± 3/64	5/16	7 oz ± 1 oz	. 012 ± . 0003	10¾	. 125 ID
51855	Governor adjusting pressure	5/8 ± 1/32	. 047	--------	. 014 ± . 0003	6	--------
52940	Stop bar	3 7/64 ± 1/64	. 375	8 oz ± ½ oz	. 016 ± . 0003	112	. 183 OD
52953	Stop bar return	9/16 ± 3/64	¼	14 oz ± 2 oz	. 018 ± . 0003	9 ± ½	15/64 OD
53308	Range dial detent	3/8	3/16	12 oz ± 2 oz	. 010 ± . 0003	11	. 058 ID
53558	Push button	¾ ± 1/32	5/8	7 oz ± 1 oz	. 020 ± . 0003	10 ± ½	. 187 ID
53961	Spool friction	½ ± 1/32	¼	20 oz ± 4 oz	. 021 ± . 0003	7¾	. 198 ID
54932	Friction clutch	½ ± 3/64	9/32	10 lbs 8 oz ± 12 oz	. 067 ± . 0005	3½	--------
54933	Clutch pressure	½ ± ¾	9/32	10 lbs 8 oz ± 12 oz	. 067 ± . 001	3½	. 687 ID
54934	Friction clutch	3/8 ± 1/32	5/16	8 lbs ± 12 oz	. 080 ± . 001	3¾	. 687 ID
54957	Platen crank	¾	--------	--------	. 025	11	. 260 OD
55518	Manual space push button	5/8	--------	--------	. 025	9½	. 343 ID
56091	Selector magnet cover	5/16 ± 3/64	5/16	--------	. 012 ± . 0003	5	. 125 ID
56249	Driver clutch	½ ± 3/64	9/32	10 lbs 8 oz ± 8 oz	. 076 ± . 001	3½	. 891 ID
56279	Square shaft bearing	1 7/32 ± 1/32	5/16	32 oz	. 028 ± . 0005	6½	. 257 ID

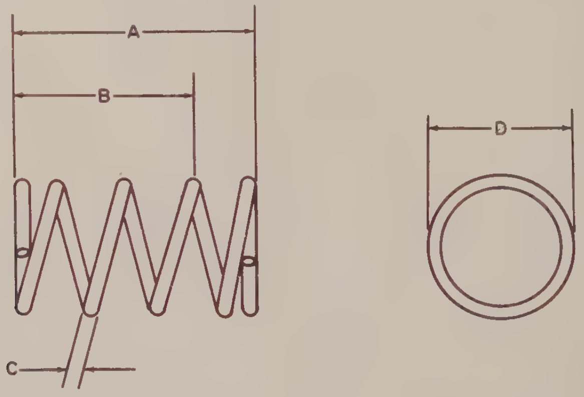


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Figure 501. Extension spring.

529. Special Spring Data

Fig. No.	Reference No.	Name	A Free length (in.)	B Compressed length (in.)	Required tension, compressed length	C Wire thickness (in.)	Number of coils	D Diameter (in.)
499	50902	Selector lever	1	1¼	8 oz. ± ½ oz	0.012 ± .0003	53 max	0.085 OD
500	52422	Tape retainer	⅜			.033 ± .0005	10	.265 ID
501	52551	Clip	½			.045 ± .0005		1.72 ID
502	53156	Tape-out lever	1 1/16 ± 1/16			.016 ± .0003	52	.188 OD
503	53888	Right-hand dust cover stay.	¼			.0625 ± .0005	1	
504	53889	Left-hand dust cover stay	¼			.0625 ± .0005	1	
505	54967	Platen trough	1 3/16			.027	43½	.179 OD
506	54991	Window	7/16			.047 ± .0005	9	.171 ID
507	54996	Cover door latch				.030 ± .0005	3 turns	5/16 OD
508	55882	Shunt switch arm	⅝	47/64	100 grams ± 10 grams.	.010 ± .0003		3/16 OD
509	55942	Detent	15/32	9/16	10 oz. ± 1 oz	.015 ± .0003	12 max	.125 OD
510	55958	Ratchet pawl	19/32	11/16	2½ oz. ± ½ oz	.011	19	.125 OD
511	55969	Contact pivot post	3/16		1–2 oz	.015 ± .0003	4	.281 ID
512	55974	Tab actuator arm	3/32			.015 ± .0003	3	.218 ID
513	55999	Keyboard counter cam follower.	3/16			.015 ± .0003	6¼	3/16 ID
514	56024	Roller support	1 5/32 ± 1/64			.014 ± .0003		.125 OD
515	56269	Carriage-return blocking lever.				.018 ± .0003	2	.500 ID
516	56323	Tape cover latch				.020 ± .0003	2	11/16 ID
517	56324	Tape cover	5/32			.024 ± .0003	6	5/32 ID

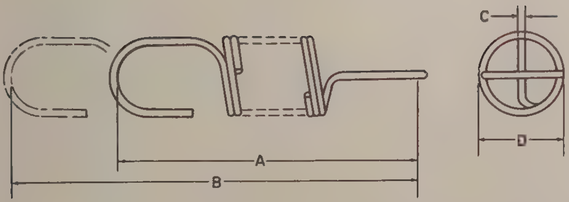

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Figure 502. Selector lever spring.

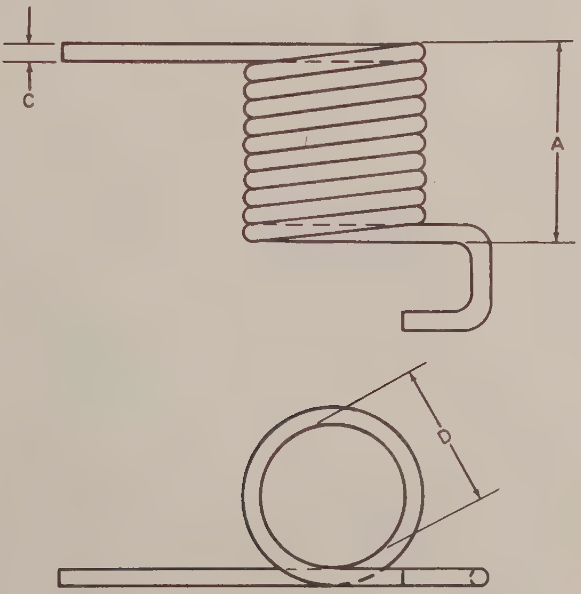

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Figure 503. Tape retainer spring.

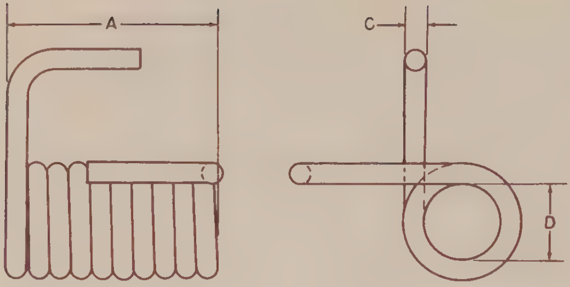


Figure 504. Clip spring.

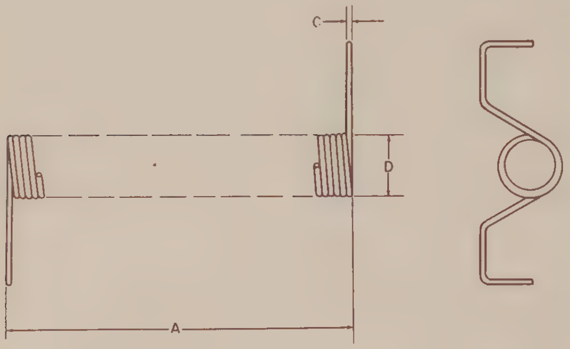


Figure 505. Tape-out lever spring.

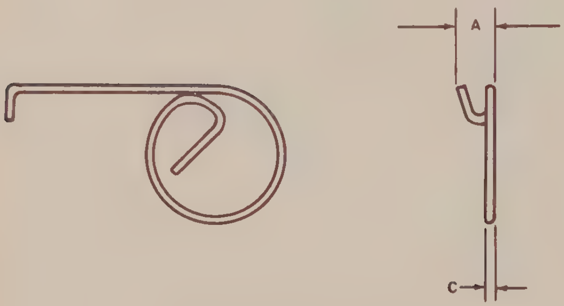


Figure 506. Right hand dust cover stay spring.

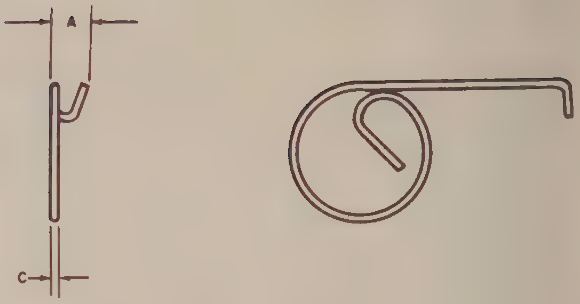


Figure 507. Left hand dust cover stay spring.

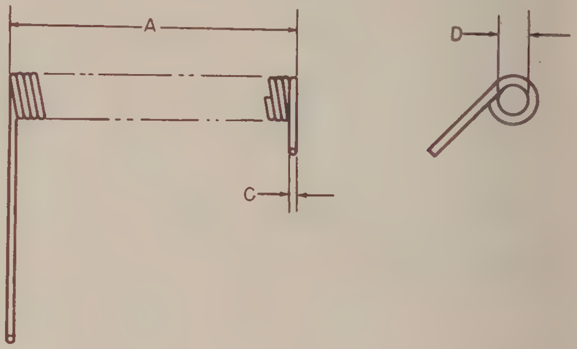


Figure 508. Platen trough spring.

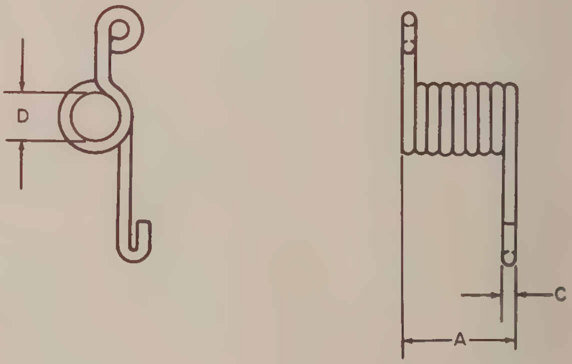


Figure 509. Window spring.

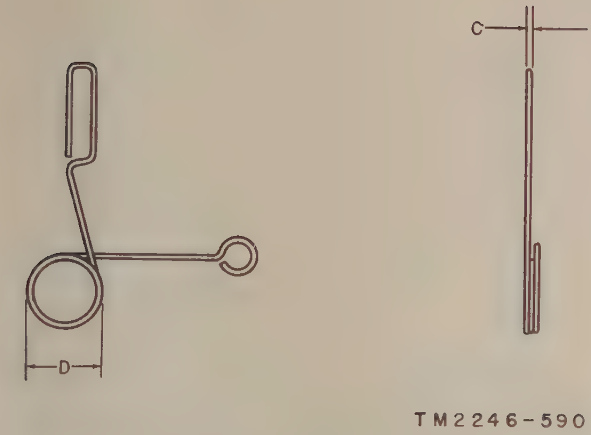


Figure 510. Cover door latch spring.

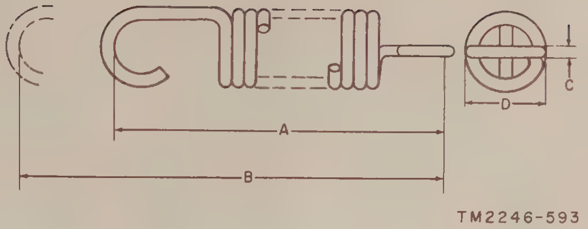


Figure 513. Ratchet spring.

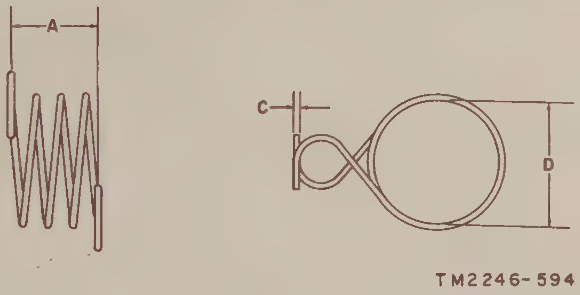


Figure 514. Contact pivot post spring.

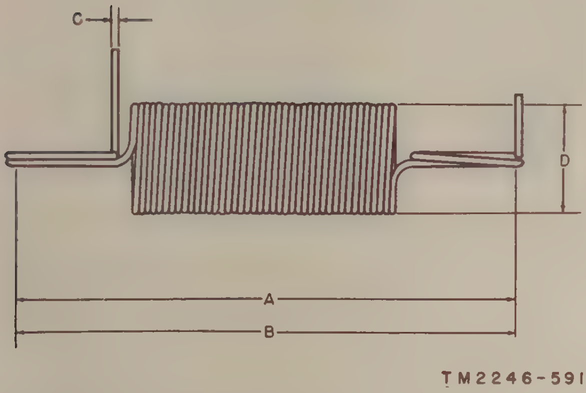


Figure 511. Shunt switch arm spring.

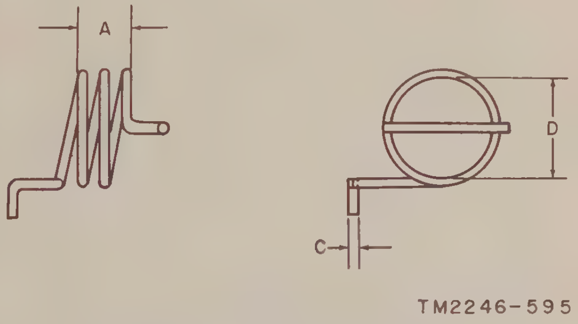


Figure 515. Tab actuator arm spring.

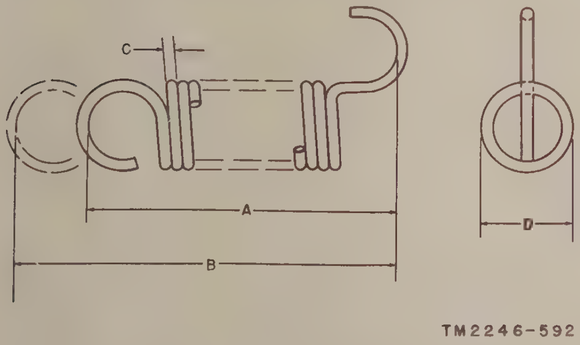


Figure 512. Detent spring.

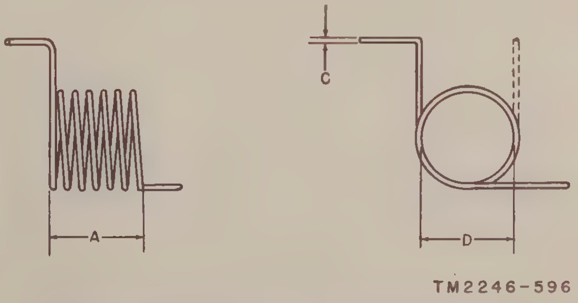


Figure 516. Keyboard counter cam follower spring.

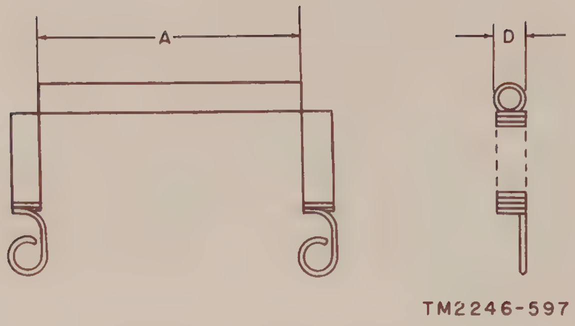


Figure 517. Roller support spring.

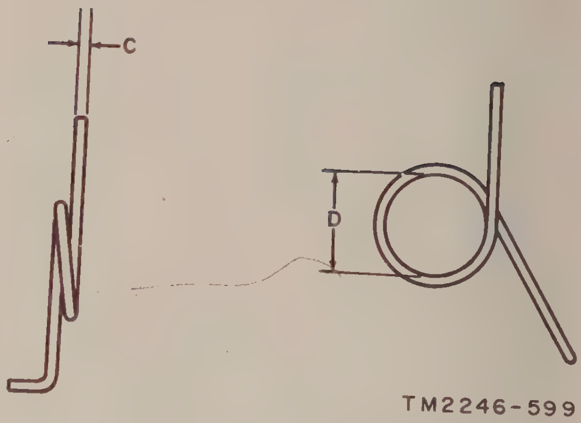


Figure 519. Tape cover latch spring.

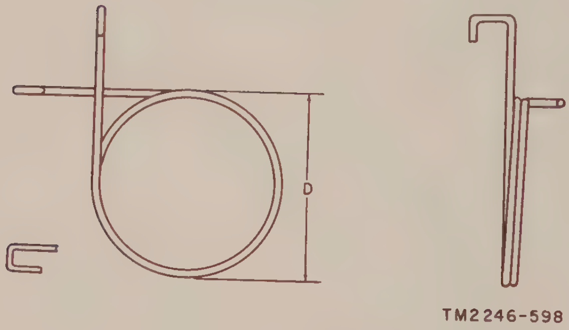


Figure 518. Carriage-return blocking lever spring.

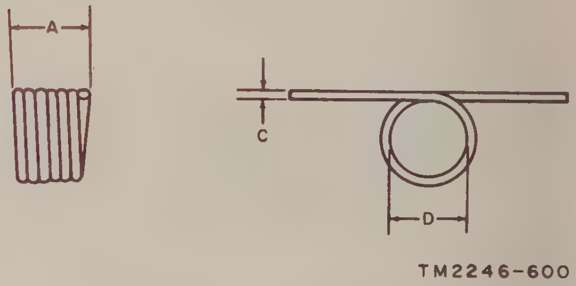


Figure 520. Tape cover spring.

Section X. FINAL TESTING

530. Test Reference Chart

The following chart lists the paragraphs containing information required for the final testing of the teleprinter.

Item	Paragraph
Test equipment	146
Local test arrangement	20, 21
Performance test	24
Troubleshooting chart	148
Bias and distortion tests	531, 532

531. Sending Tests

Signals transmitted by the keyboard transmitter and by the transmitter-distributor can be analyzed by the Distortion Test Set TS–383/GG to detect any deviation from normal signals, enabling maintenance personnel to determine what adjustments and corrections, if any, must be made in the sending units to enable them to send correct, undistorted signals. Consult the applicable technical manual for detailed use of the distortion test set. Set up the test as follows.

a. Connect the teleprinter in the local test condition described in paragraphs 20 and 21.

b. Adjust the control switches on the perforator as follows:

- (1) Keyboard control switch (S23)—KEYBD.
- (2) Perforator control switch (S31)—REPERF.
- (3) Line switch key (S28)—TEST.
- (4) ALR MONITOR switch (S24)—OFF.

c. Connect the receive cord from the test set into the receive test jack on the back perforator panel. This connects the test set in series with the teleprinter.

d. Test the signals sent from the keyboard transmitter and from the transmitter-distributor as described in the distortion test set manual. The signal bias of the keybroad transmitter or transmitter-distributor must not exceed 5 percent.

532. Receiving Tests

a. Preparation.

(1) Connect the teleprinter in the local test condition described in paragraphs 20 and 21.

(2) Adjust the perforator control switches as follows:

(*a*) Keyboard control switch (S23)—KEYBD.

(*b*) Perforator control switch (S31)—REPERF.

(*c*) Line switch key (S28)—TEST.

(*d*) ALR MONITOR switch (S24)—OFF.

(3) Plug the send plug of the test set into the send test jack on the back perforator panel. This connects the distortion test set in series with the teleprinter. Signals transmitted by the test set can be received by the page printing mechanism or perforator.

(4) Adjust the motor speed of the page printing mechanism and perforator motors as described in paragraph 22.

(5) Send the test message from the test set with undistorted signals, receiving the message on both the perforator and the page printing mechanism.

b. Range Test.

(1) Adjust the page printing mechanism and the perforator as follows:

(*a*) On equipments with serial numbers below 300, unsolder a lead to the bias potentiometer and connect an ammeter in series with the potentiometer. Loosen the locknut on the bias potentiometer shaft and turn the shaft with a screw driver until a reading of 8.2 ma is obtained for 20-ma operation or a reading of 12-ma is obtained for 60-ma operation. Tighten the locknut and recheck the adjustment. Adjust the perforator and page printing mechanism bias potentiometer in this manner. Disconnect the ammeter and resolder the lead.

(*b*) On equipments with serial numbers above 300, binding posts for checking the bias potentiometer setting are provided at the rear of the page printing mechanism on the terminal box. On the perforator, the binding posts are provided at the top of the patch panel. To adjust the bias potentiometer setting for either unit, disconnect the strap that connects the binding posts and connect an ammeter across the posts. Loosen the locknut on the shaft of the bias potentiometer and turn the shaft with a screw driver until a reading of 8.2-ma is obtained for 20-ma operation or a reading 12-ma is obtained for 60-ma operation. Tighten the locknut and recheck the adjustment. Disconnect the ammeter and reconnect the strap between the binding posts.

(2) Arrange the test set to transmit undistorted signals.

(3) While still receiving the test message, determine the upper limit and the lower limit of the page printing mechanism and perforator range with the rangefinder dial.

(4) Calculate the difference between the upper and lower good copy limits. The difference should be at least 72 units of the dial for 368.1 opm (60-wpm) or 60 units per 600 opm (100-wpm) operation.

(5) Set the rangefinder dials at the midpoint between the two limits of the range.

c. Bias Tolerance Test. The page printing mechanism and the perforator should print good copy when receiving signals containing controlled amounts of distortion. The bias tolerance of a properly adjusted receiving unit operating at 368.1 opm, should be a minimum of 40 percent. The bias tolerance of the properly adjusted set operating at 600 opm should be a minimum of 35 percent. The formula given in (5) below is used to compute the bias tolerance. When signal distortion test sets are arranged to transmit signals with a bias distortion, the set changes the beginning time of each impulse with respect to the beginning time of the start impulse. When adjusted to transmit signals with a *marking bias* the test set advances the beginning of each marking impulse. When adjusted to transmit signals with a *spacing bias* the set retards the beginning of each marking impulse. The bias tolerance of the receiving units may be tested as follows:

(1) Connect the teleprinter, as described in *a* above.

(2) Set the bias potentiometer as described in *b*(2) above.

(3) Adjust the test set to transmit test signals with a marking bias of 35 percent. Use these signals to determine the upper range limit with the rangefinder.

(4) Adjust the test set to transmit test signals with a 35 percent spacing bias. Determine the lower limit of the range.

(5) Compute the bias tolerance for both the page printing mechanism and the perforator using the following formula:

$$\text{Bias tolerance} = 35 + \frac{\begin{pmatrix}\text{upper limit}\\ \text{marking bias}\end{pmatrix} - \begin{pmatrix}\text{lower limit}\\ \text{spacing bias}\end{pmatrix}}{2}$$

d. End Distortion Test. The receiving unit should operate properly while receiving signals containing end distortion within certain minimum limits. The end distortion tolerances of a properly adjusted receiving unit operating at 368.1 opm should be a minimum of 35 percent. When signal distortion test sets are adjusted to transmit signals with end distortion, the set changes the ending time of each marking impulse with respect to the beginning time of each start impulse. When adjusted to transmit signals with a spacing end distortion, the set advances the end of each marking code impulse with respect to the beginning time of the start impulse. When adjusted to transmit test signals with a marking end distortion, the test set retards the end of each marking code impulse. The end distortion tolerance of the page printing mechanism and perforator may be tested in the following manner:

(1) Connect the teleprinter as described in *a* above. Adjust the test set to transmit test message signals.

(2) Set the bias potentiometer at the optimum setting as described in *b*(2) above.

(3) Adjust the test set to transmit test signals with 35 percent spacing end distortion. Using the test signals, determine the upper range limits with the rangefinder.

(4) Adjust the test set to transmit test signals with a 35 percent marking end distortion. Determine the lower limit of the range.

(5) Compute the end distortion tolerance of the receiving unit using the following formula:

$$\begin{matrix}\text{End distortion}\\ \text{tolerance}\end{matrix} = 35 + \frac{\begin{pmatrix}\text{Upper limit}\\ \text{spacing end}\\ \text{distortion}\end{pmatrix} - \begin{pmatrix}\text{Lower limit}\\ \text{marking end}\\ \text{distortion}\end{pmatrix}}{2}$$

e. Internal Bias. Internal bias of a receiving unit is a computed measurement of the effect of maladjustment, wear, or some other mechanical fault within the mechanism. It is used as a measure of the mechanical efficiency of the receiving unit. The internal bias of the page printing mechanism perforator is found by calculating the difference between the bias tolerance orientation point (midpoint between the high and low range limits (*c* above) and the end distortion orientation point (*d* above)). If the difference between the two orientation points exceeds six points, some mechanical fault is present and the page printing mechanism should be rechecked for maladjustment or other mechanical fault.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

533. Disassembly

Prepare these sets for storage in the following steps:

a. Disconnect the signal and power cords from the teleprinter.

b. Disconnect all cords and cables connecting the page printing mechanism to the perforator.

c. Remove the paper roll or fanfold forms from the page printing mechanism and the tape roll from the perforator.

d. Empty the chad bin and spent tape box.

e. Remove the extra copy holder from the page printing mechanism.

f. Remove the page printer and the perforator from the table.

g. Remove the spent tape guide and tape storage guide from the table.

h. Remove the line relay adapter box from the table.

i. Move the carriage to the left-hand margin; lock it in place with the carriage lock at the left of the carriage guide rail. Lock the platen in place with the lock at the upper right of the page printer frame.

534. Packing

Pack the equipment for storage as follows:

a. Secure the page printer to the shipping base board and place it in the shipping and storage case.

b. Secure the perforator to the shipping base board and place it in the shipping and storage case.

c. Seal both of the cases with gummed tape.

d. Wrap the cases with a vapor barrier material and insert each case into a second shipment and storage box.

e. If the equipment is to be stored for a considerable length of time, place a sufficient amount of desiccant near the equipment to prevent any damage by moisture. Use silica jel or other approved desiccant.

f. If shipment is to be over a great distance or extremely rough terrain, the units should be placed in wooden containers.

g. Pack the running spares, instruction books, spent tape guide, tape storage guide, copy holder, and line relay adapter box in a cardboard carton; place the carton in the spent tape and chad bin. Position the chad bin in the bottom of the table.

h. Install the necessary filler strips on the table and position the table in the shipping and storage case; seal the case with gummed tape.

i. Place the table package in a wooden box if it is to be shipped a great distance or over rough terrain.

Section II. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE

535. General

Demolition of the equipment will be accomplished only upon the order of the commander. The demolition procedures outlined in paragraph 543 will be used to prevent the enemy from using or salvaging the equipment.

536. Destruction of Components

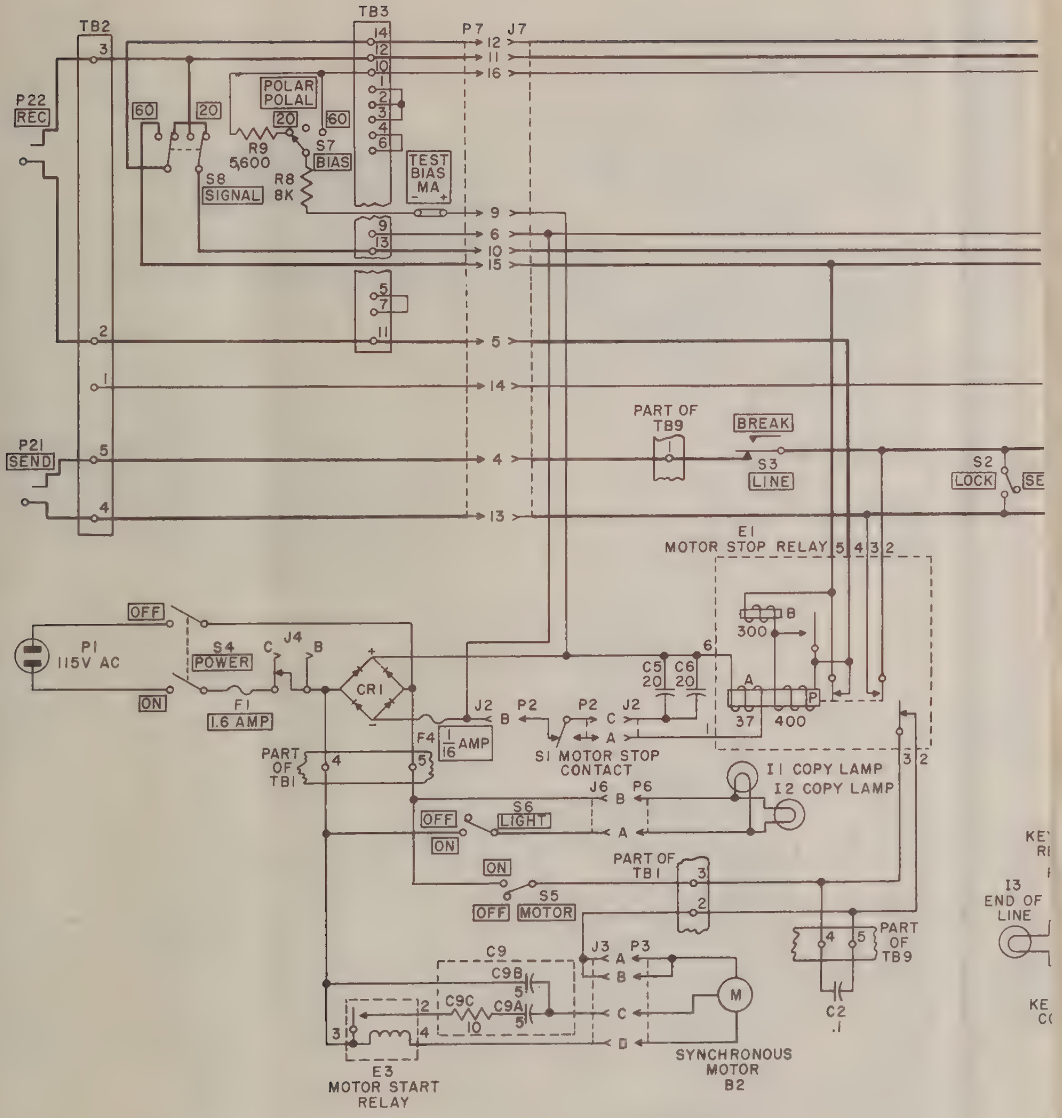
a. Smash. Smash the page printing mechanism, perforator, keyboard transmitter, transmitter-distributor covers, frames, accessories, controls, switches, and all other parts; use sledges, crowbars, axes, handaxes, pickaxes, hammers, or heavy tools.

b. Cut. Cut all cords and wiring; use axes, handaxes, or machetes.

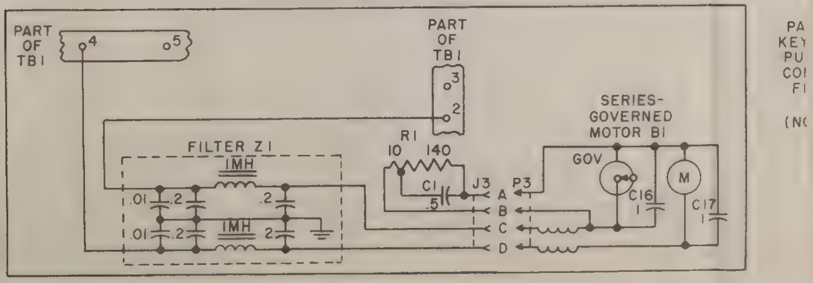
c. Burn. Burn technical manuals, circuit labels, other diagrams, resistors, coils, capacitors, cords, and wiring; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

e. Disposal. Bury, scatter, and destroy parts in slit trenches, foxholes, or throw them in streams.



AN/FGC-25X MOTOR CIRCUIT



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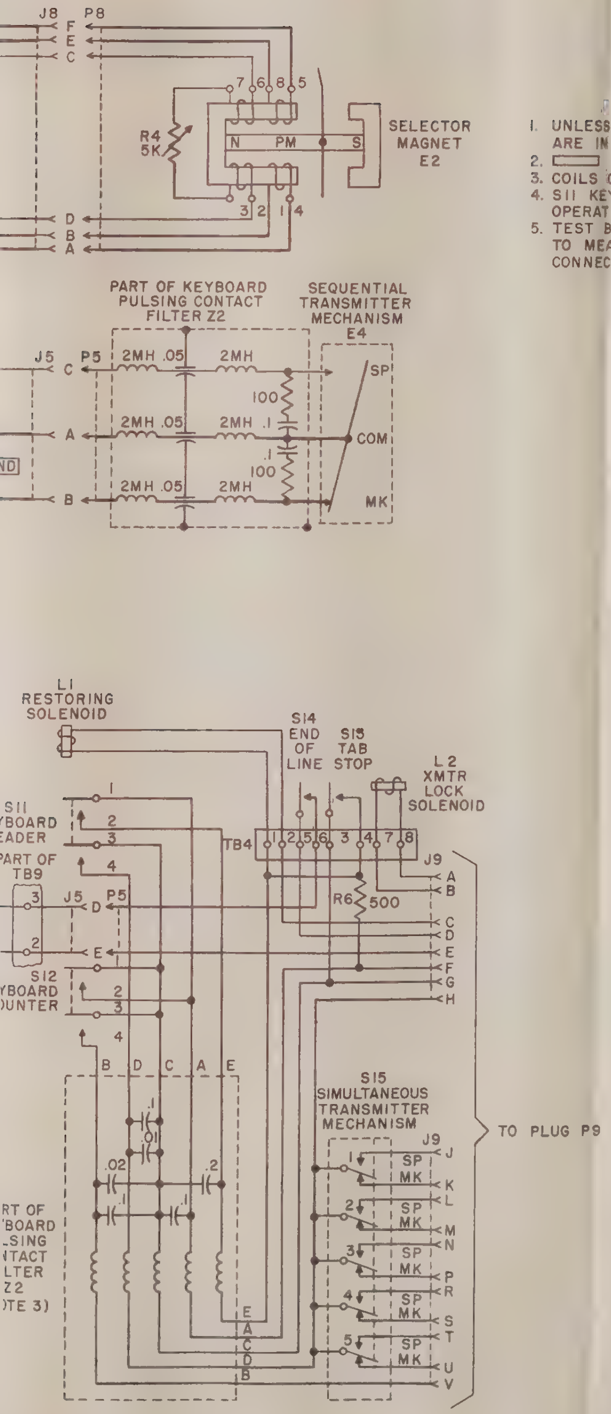

NOTES:

1. UNLESS OTHERWISE INDICATED; RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF
2. ▭ INDICATES EQUIPMENT MARKING
3. COILS OF FILTER Z2 ARE 1MH
4. S11 KEYBOARD READER CONTACTS KEY LEVER OPERATED
5. TEST BIAS MA PROVIDES AMMETER CONNECTION POINT TO MEASURE BIAS CURRENT; NORMALLY CONNECTED WITH STRAP

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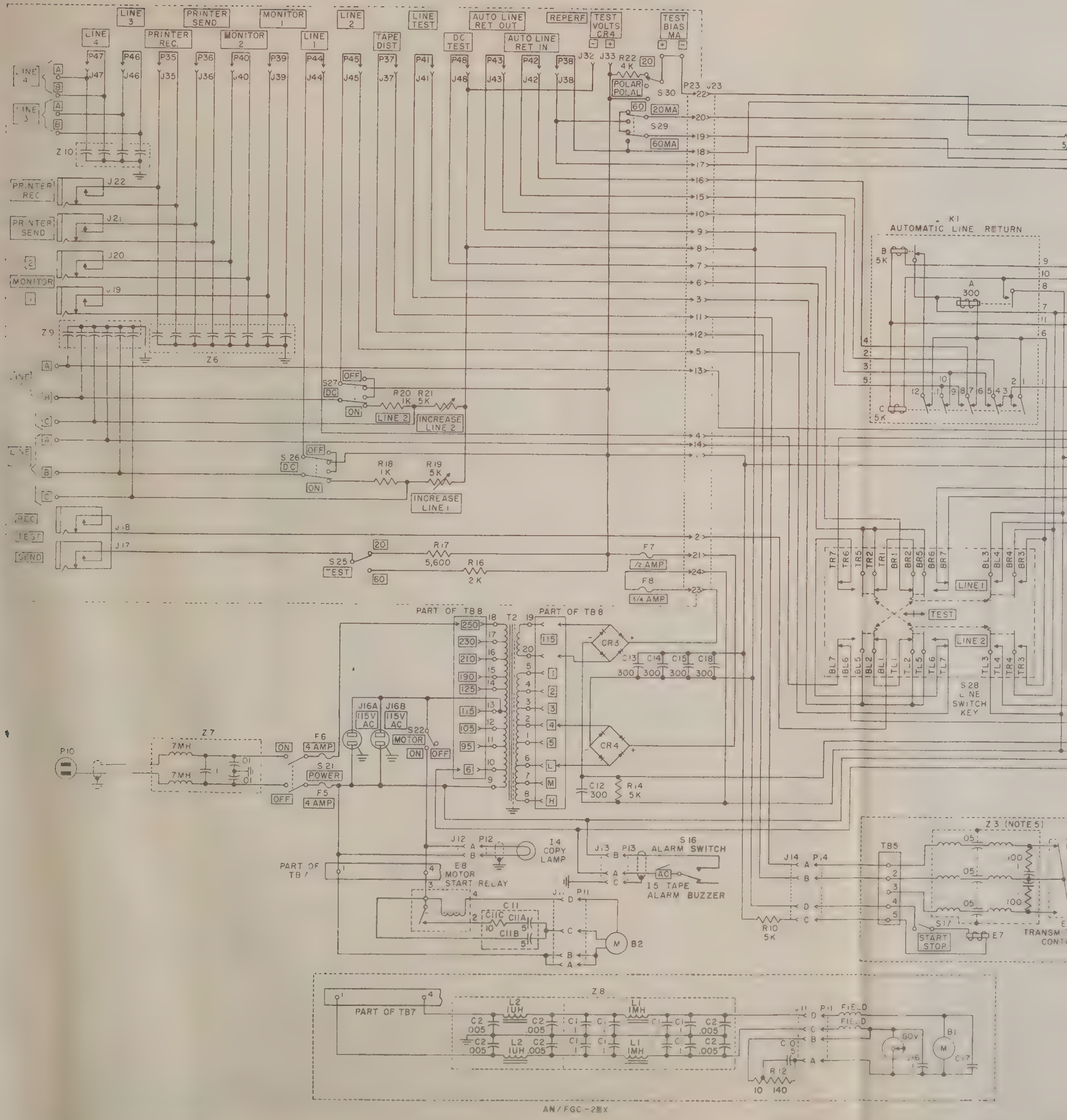
ter, schematic diagram.



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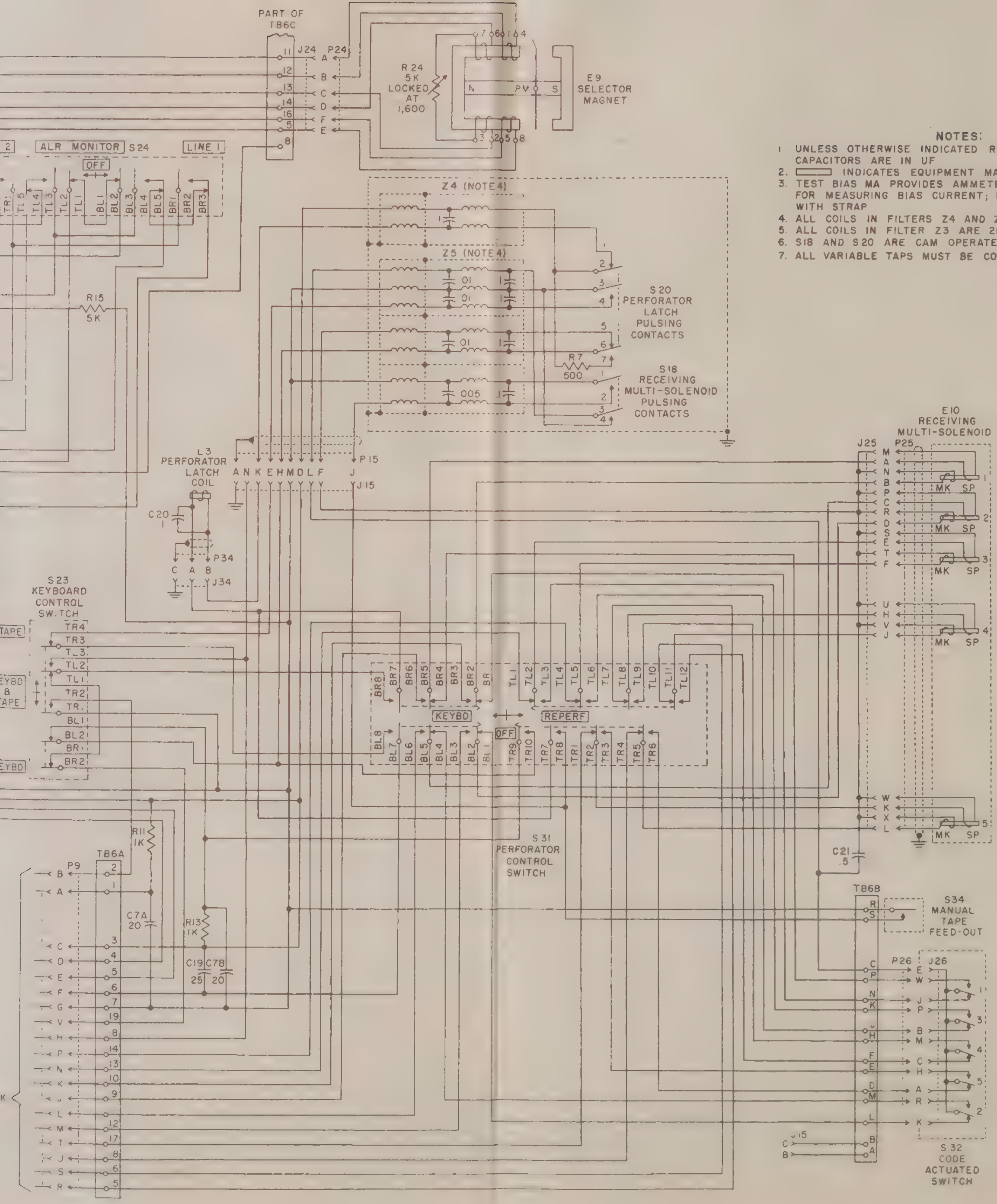

NOTES:

1. UNLESS OTHERWISE INDICATED RESISTORS ARE IN OHMS; CAPACITORS ARE IN UF
2. ▭ INDICATES EQUIPMENT MARKING
3. TEST BIAS MA PROVIDES AMMETER CONNECTION POINT FOR MEASURING BIAS CURRENT; NORMALLY CONNECTED WITH STRAP
4. ALL COILS IN FILTERS Z4 AND Z5 ARE IMH
5. ALL COILS IN FILTER Z3 ARE 2MH
6. S18 AND S20 ARE CAM OPERATED
7. ALL VARIABLE TAPS MUST BE CONNECTED

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or, schematic diagram.

NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH TO WIRE RUNS.
2. ⊂⊐⊱ DENOTES SHIELDED CONNECTION.
3. ▭ INDICATES EQUIPMENT MARKING.
4. J4 IS USED ONLY WHERE A SEPARATE POWER SUPPLY IS USED FOR THE TELETYPEWRITER TT-117/FJ.

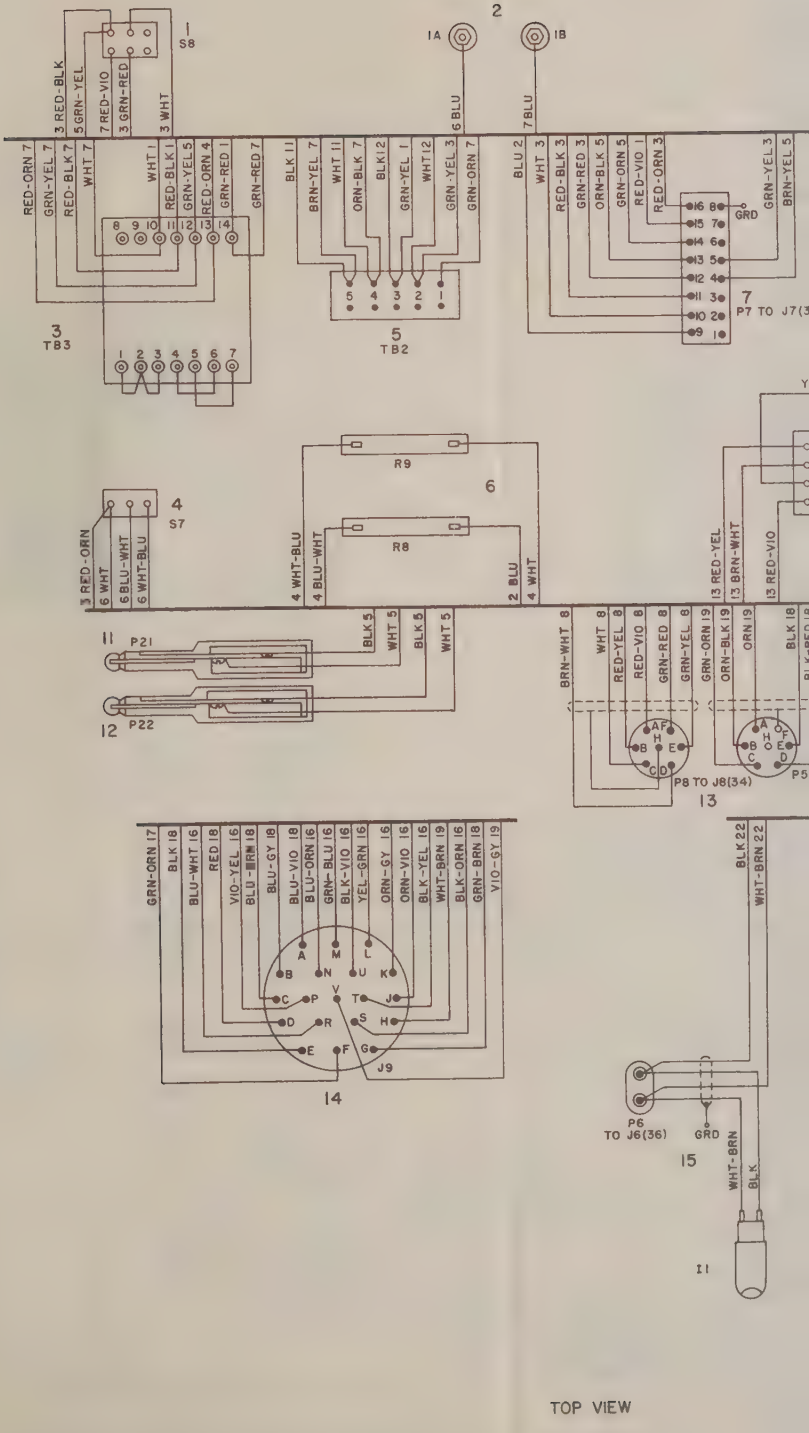
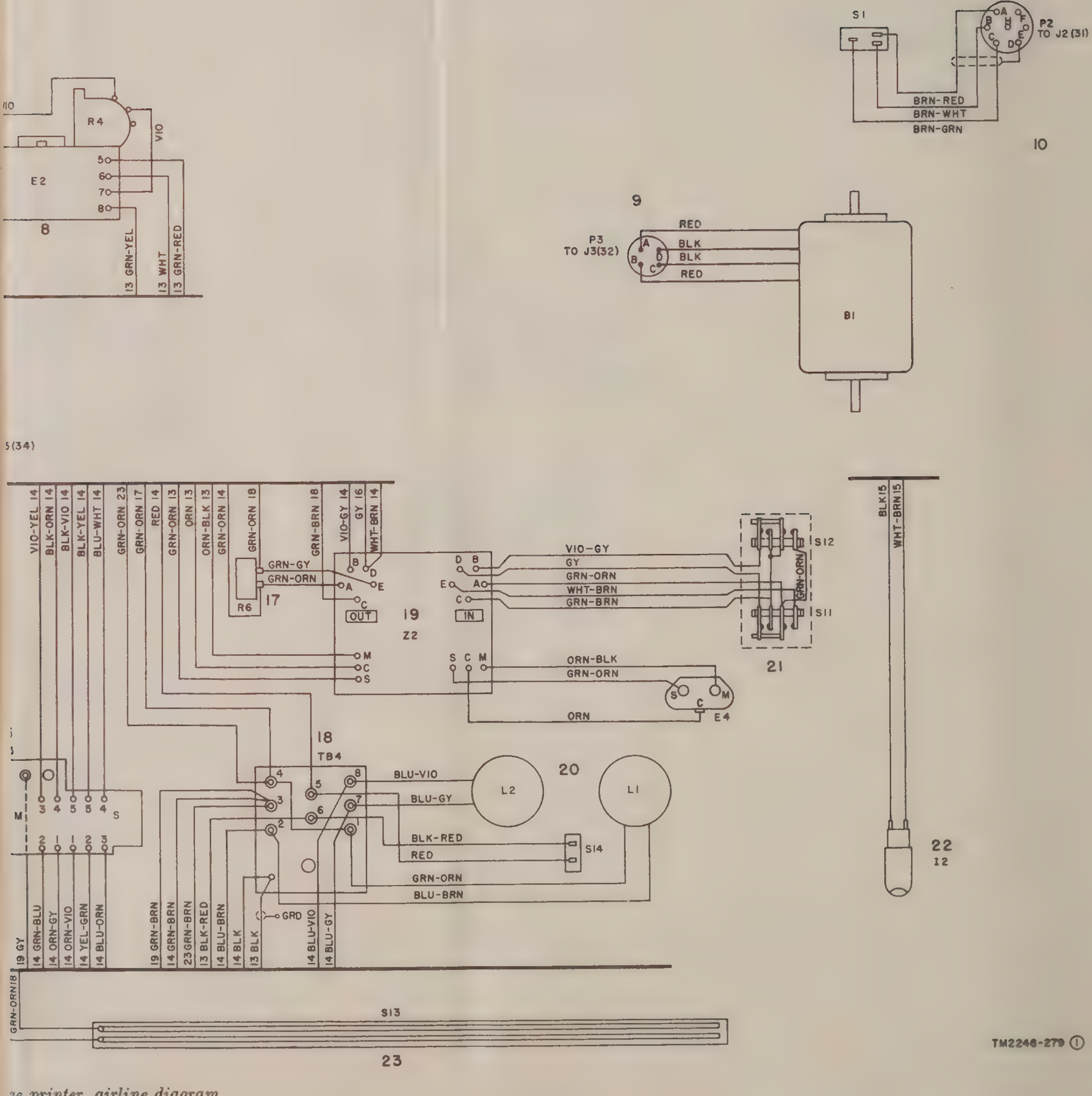


Figure 523.



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ge printer, airline diagram.

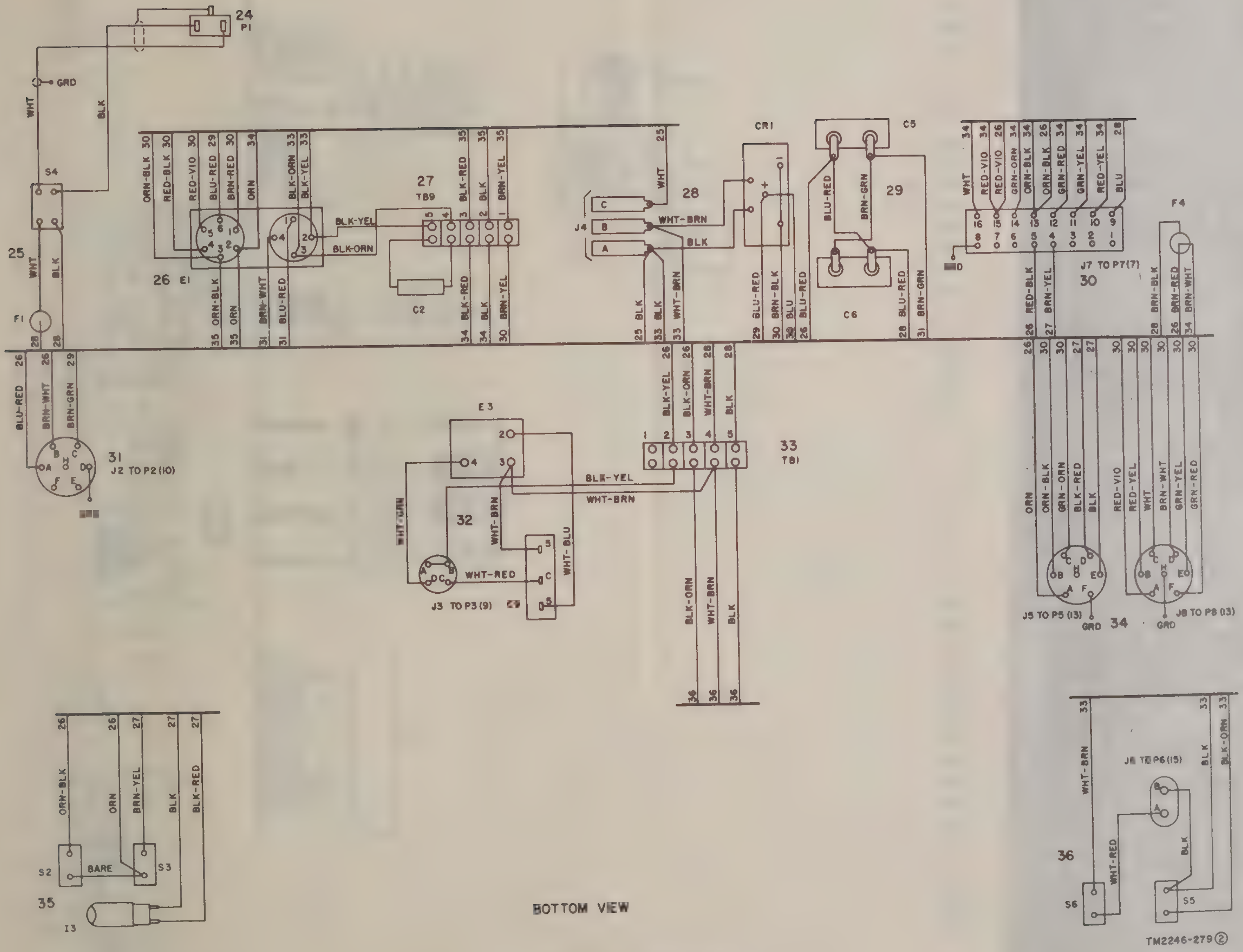
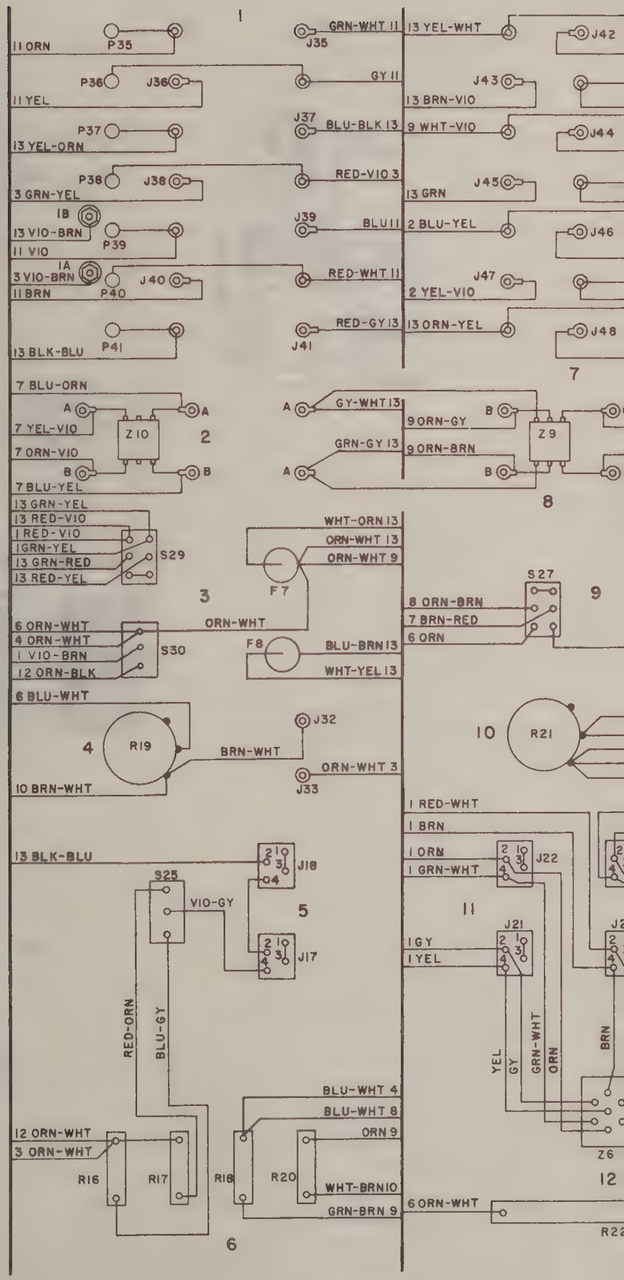


Figure 523.—Continued.

390618 O -56 (Face p. 480 bk.) No. 4

NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. ⊂⊃— DENOTES SHIELDED CONNECTION.
3. ▭ INDICATES EQUIPMENT MARKING.
4. PLUG AND JACK CROSS REFERENCES AT STATIONS 1 AND 7 ARE DETERMINED BY LOCAL PATCHING CONDITIONS.
5. J17 AND J18 ARE TEST SEND AND RECEIVE JACKS.
6. J19 AND J20 ARE PROVIDED FOR MONITOR EQUIPMENT.
7. J21 AND J22 (STATION 11) ARE TO P21 AND P22 OF THE AIRLINE FOR TT-117/FJ.
8. J32 AND J33 ARE FOR TEST VOLTS CR4.
9. S23 IS SHOWN IN THE KEYBD & TAPE POSITION.



390618 O -56 (Face p. 480 bk.) No. 5

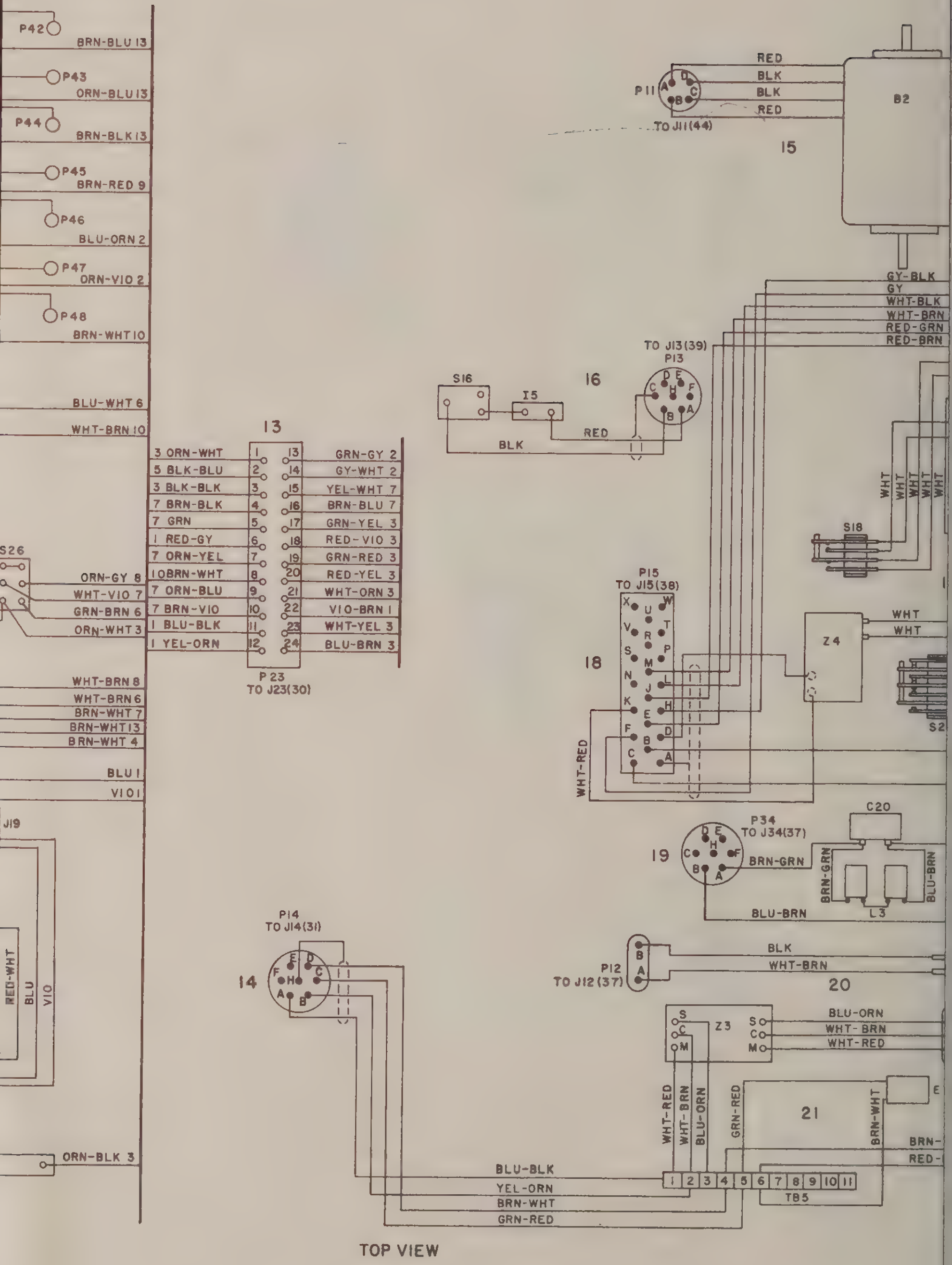
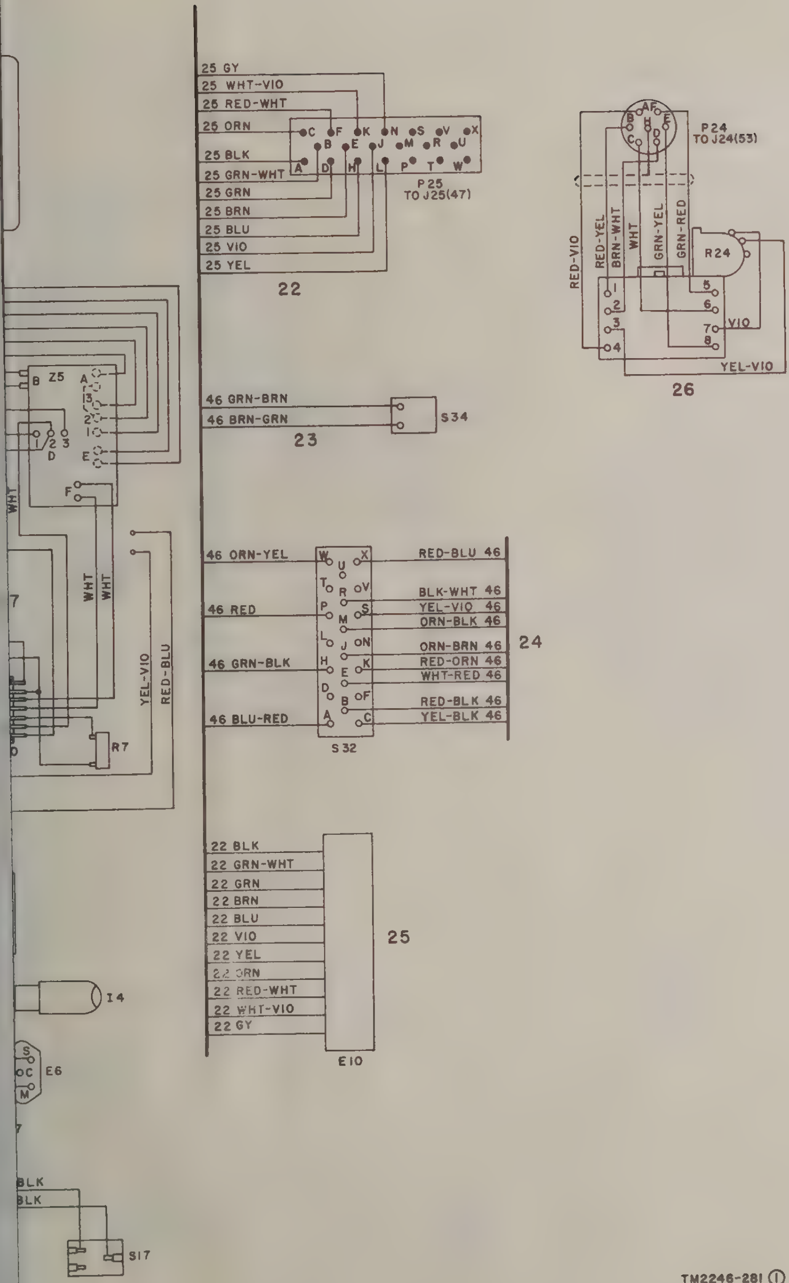


Figure 524. Perforator, airline diagram.


25 GY
25 WHT-VIO
25 RED-WHT
25 ORN
25 BLK
25 GRN-WHT
25 GRN
25 BRN
25 BLU
25 VIO
25 YEL
C F K N S V X
B E J M R U
A D H L P T W
P25
TO J25(47)
22
P24
TO J24(53)
A F B H E C D
RED-VIO
RED-YEL
BRN-WHT
WHT
GRN-YEL
GRN-RED
R24
1 2 3 4 5 6 7 8
VIO
YEL-VIO
26
Z5
B A 13 2 1 E F D 1 2 3
WHT
WHT
WHT
46 GRN-BRN
46 BRN-GRN
S34
23
YEL-VIO
RED-BLU
R7
46 ORN-YEL
46 RED
46 GRN-BLK
46 BLU-RED
W U X T R V P M S L J N H E K D B F A C
S32
RED-BLU 46
BLK-WHT 46
YEL-VIO 46
ORN-BLK 46
ORN-BRN 46
RED-ORN 46
WHT-RED 46
RED-BLK 46
YEL-BLK 46
24
22 BLK
22 GRN-WHT
22 GRN
22 BRN
22 BLU
22 VIO
22 YEL
22 ORN
22 RED-WHT
22 WHT-VIO
22 GY
25
E10
I4
S C M
E6
BLK
BLK
S17

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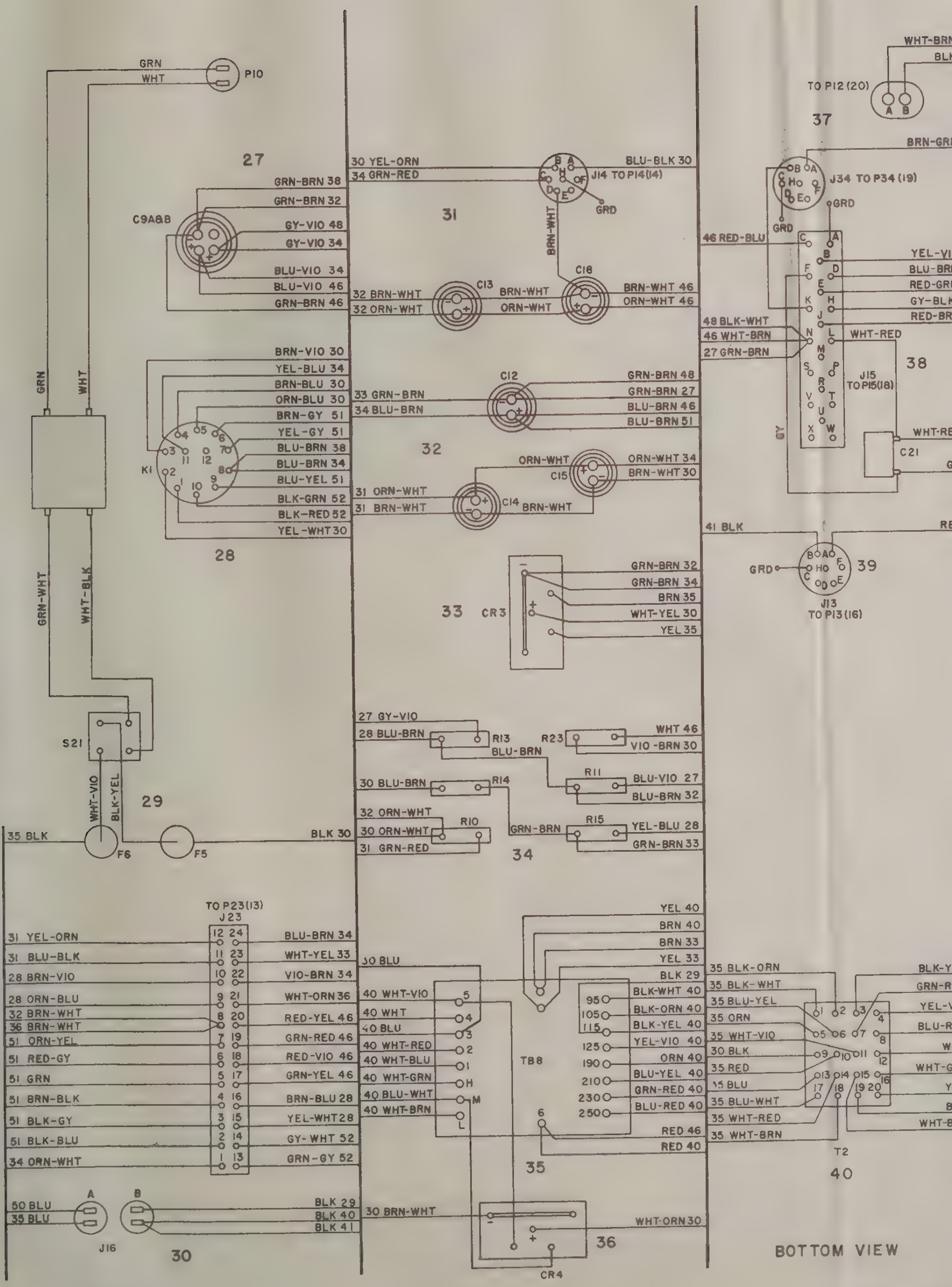
GRN
WHT
P10
GRN
WHT
GRN-WHT
WHT-BLK
S21
WHT-VIO
BLK-YEL
29
35 BLK
F6
F5
BLK 30
27
GRN-BRN 38
GRN-BRN 32
C9A&B
GY-VIO 48
GY-VIO 34
BLU-VIO 34
BLU-VIO 46
GRN-BRN 46
BRN-VIO 30
YEL-BLU 34
BRN-BLU 30
ORN-BLU 30
BRN-GY 51
YEL-GY 51
BLU-BRN 38
BLU-BRN 34
BLU-YEL 51
BLK-GRN 52
BLK-RED 52
YEL-WHT 30
K1
28
30 YEL-ORN
34 GRN-RED
J14 TO P14(14)
GRD
BLU-BLK 30
BRN-WHT
31
C13
C18
32 BRN-WHT
32 ORN-WHT
BRN-WHT
ORN-WHT
BRN-WHT 46
ORN-WHT 46
C12
33 GRN-BRN
34 BLU-BRN
GRN-BRN 48
GRN-BRN 27
BLU-BRN 46
BLU-BRN 51
32
ORN-WHT
C15
ORN-WHT 34
BRN-WHT 30
31 ORN-WHT
31 BRN-WHT
C14
BRN-WHT
33
CR3
GRN-BRN 32
GRN-BRN 34
BRN 35
WHT-YEL 30
YEL 35
27 GY-VIO
28 BLU-BRN
R13
BLU-BRN
R23
WHT 46
VIO-BRN 30
30 BLU-BRN
R14
R11
BLU-VIO 27
BLU-BRN 32
32 ORN-WHT
30 ORN-WHT
31 GRN-RED
R10
GRN-BRN
R15
YEL-BLU 28
GRN-BRN 33
34
TO P23(13)
J23
31 YEL-ORN
31 BLU-BLK
28 BRN-VIO
28 ORN-BLU
32 BRN-WHT
36 BRN-WHT
51 ORN-YEL
51 RED-GY
51 GRN
51 BRN-BLK
51 BLK-GY
51 BLK-BLU
34 ORN-WHT
BLU-BRN 34
WHT-YEL 33
VIO-BRN 34
WHT-ORN 36
RED-YEL 46
GRN-RED 46
RED-VIO 46
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BRN-BLU 28
YEL-WHT 28
GY-WHT 52
GRN-GY 52
50 BLU
35 BLU
J16
30
BLK 29
BLK 40
BLK 41
30 BLU
40 WHT-VIO
40 WHT
40 BLU
40 WHT-RED
40 WHT-BLU
40 WHT-GRN
40 BLU-WHT
40 WHT-BRN
YEL 40
BRN 40
BRN 33
YEL 33
BLK 29
TB8
BLK-WHT 40
BLK-ORN 40
BLK-YEL 40
YEL-VIO 40
ORN 40
BLU-YEL 40
GRN-RED 40
BLU-RED 40
RED 46
RED 40
35
30 BRN-WHT
WHT-ORN 30
CR4
36
WHT-BRN
BLK
TO P12(20)
37
BRN-GR
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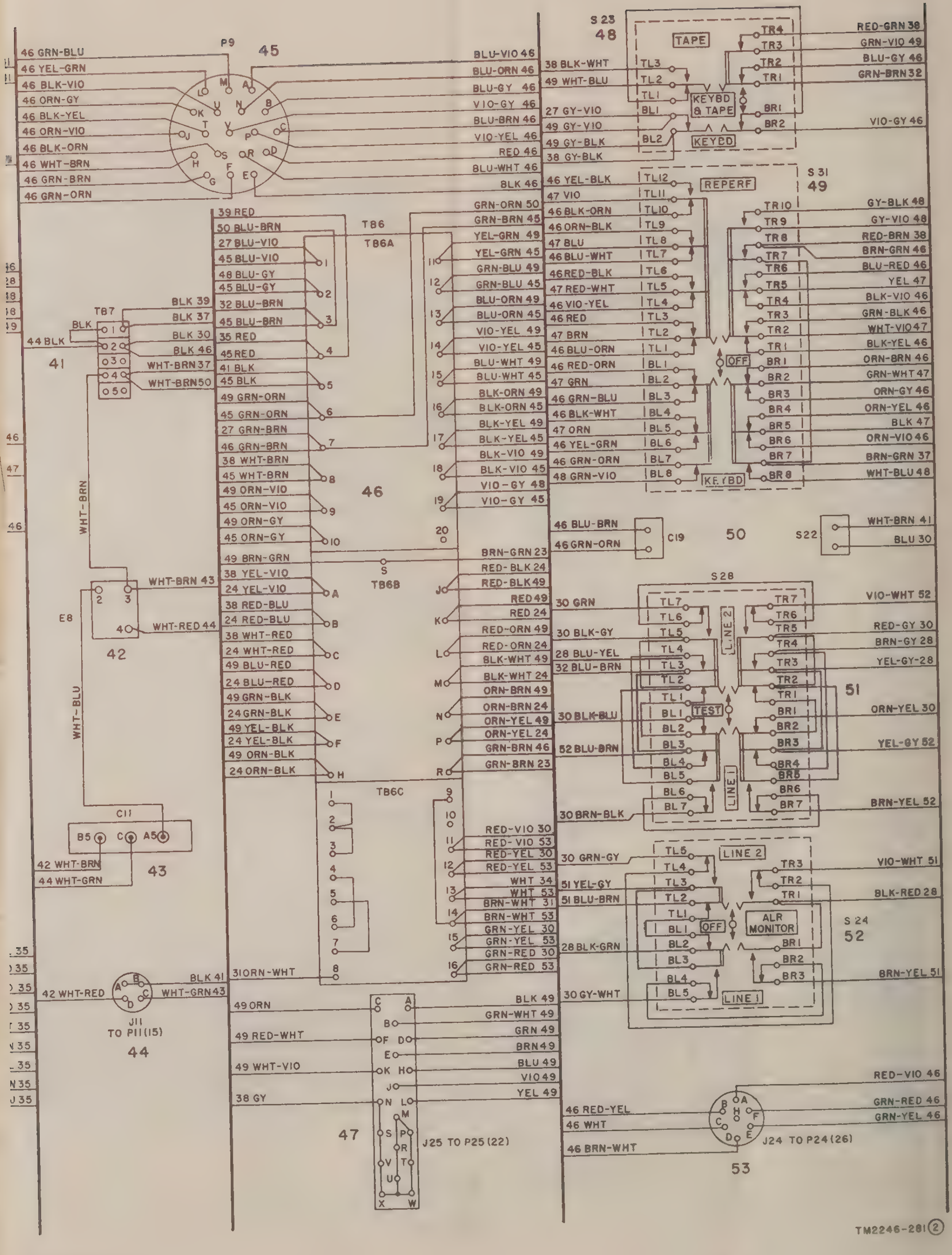
GRD
46 RED-BLU
YEL-VI
BLU-BR
RED-GR
GY-BL
RED-BR
48 BLK-WHT
46 WHT-BRN
27 GRN-BRN
WHT-RED
38
J15 TO P15(18)
GY
WHT-RE
C21
41 BLK
RE
GRD
39
J13 TO P13(16)
35 BLK-ORN
35 BLK-WHT
35 BLU-YEL
35 ORN
35 WHT-VIO
30 BLK
35 RED
35 BLU
35 BLU-WHT
35 WHT-RED
35 WHT-BRN
BLK-Y
GRN-R
YEL-V
BLU-R
WHT-G
WHT-B
T2
40
BOTTOM VIEW

Figure 52



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- Sig Depots (17)
- Army Terminals (2)
- Trans Terminal Comd (2)
- POE (OS) (2)
- OS Sup Agencies (2)
- Army Elct PG (1)
- Sig Fld Maint Shops (1)
- Sig Lab (5)
- Mil Dist (1)
- Army Cml Cen (4)
- Units organized under following TOE's:
  - 11–7C (2)
  - 11–16C (2)
  - 11–57C (2)
  - 11–127R (2)
  - 11–128R (2)
  - 11–500R (AA–AE) (2)
  - 11–557C (2)
  - 11–587R (2)
  - 11–592R (2)
  - 11–597R (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see SR 320–50–1.

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